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VOL. XIV CHICAGO, NOVEMBER, 1915 No. 5

All the Independents in One Convention

THE announcement of a joint convention to be held by the two national independent associations may come as a surprise to many of our readers. The surprise, however, should be an agreeable one. We may find many a good argument for competition in telephone service, but there has never been adequate room for competition in the matter of independent conventions.

Last January, just before the Independent Telephone Association of America and the National Independent Telephone Association held their separate conventions four hundred miles apart, TELEPHONE ENGINEER ventured upon this prediction:

> * * * We want to urge that even the most dissatisfied hold their patience for this once more, and continue to co-operate with both associations in the matter of convention exhibits and attendance. It may be the last time they will be even asked to do so; for the next year will surely bring changes in the relations of the two independent bodies. * * * We have always regarded the existence of two associations, both ostensibly serving the same field, as economically wrong. In this we are not disputed. That amalgamation of the two is not impossible, is the belief of many; and those who are interested will not be idle during 1915.

We are glad to see the first fruits of this effort revealed as a joint convention. The only reason there ever were two associations was because two factions of independents thought they could not get along together. By arranging a common meeting they have proved that they can.

From a united convention to a united association is only a step. In the interests of economy and efficiency it is an advisable step. If one convention is sufficient, one set of officers, one board of directors and one name is sufficient and certainly desirable.

Both associations have enjoyed excellent attendance at their last two annual meetings. Add them together and they should make the biggest kind of a convention. We anticipate a marked increase in independent enthusiasm as a result of the amicable adjustment of those misunderstandings which have hitherto held the two organizations asunder.

If this is to be the biggest independent convention in telephone history—which we believe it is—there is one detail which, for the dignity of the industry, should not be overlooked. For many years past, when independent conventions have been held in Chicago, it has been the custom of his honor, the mayor of that city to send a substitute for himself to welcome the assembled delegates.

This year the independents should be welcomed by William Hale Thompson in person. We realize that the mayor of the second city cannot himself meet all the conventions that invade the big center of activity in the course of a year. But in view of the loyalty of the independent organizations to Chicago, and the shortcomings of previous mayors in recognizing them, we hope Mayor Thompson will be there.

The Triumph of Wireless

OPERATING telephone men have always been cynics on the wireless question. There is good reason why they should be. With the first reports of extremely limited success with the wireless telephone, years ago, the credulous press and more credulous public jumped at once to the conclusion that the days of the wires were numbered. There is no recorded evidence that this attitude affected the securities of telephone companies. But it is reasonable to assume that it had some detrimental influence. And knowing as they well did the very circumscribed possibilities of wireless it is no wonder that they came to hate the very word.

It is as well to state at the outset, for the benefit of those nontechnical readers before whose eyes this may fall, that wireless telephony will not affect wire telephony in this generation. Beyond that we do not care to make any predictions. We cannot now see any reason why the commercial operation of telephone exchanges as at present conducted should be influenced in the slightest degree by the perfection of wireless communication. But discovery and invention move constantly forward, and he who makes positive assertions on the side of conservation may be confounded tomorrow.

For it must be admitted that the wireless telephone has triumphed by a sudden and wonderful strategy. It has outdistanced the wires by half. It has thrown a perfect voice wave across gulfs that could not be spanned by any pole line, and where the most ingeniously constructed cable would soak up the vibrations like a Maxim silencer, delivering no sound at the other end.

The lid is off on wireless telephony. It no longer has limitations of distance. It has equaled, and surpassed, all the wonders of wireless telegraphy. It is lifted at once from a charming experiment to an international power—and therein will lie its useful function. It will not supplant the toll line across continents, but will supplement it across oceans. It will not improve the art of telephony in its present field, but will extend that field around the world. Where we talked by wire we will continue to talk by wire; but we will talk by wireless where our voice has never reached before. We will even couple wires and wireless end to end, and talk over both, as a farmer's line is connected to a central energy line.

Because operating telephone men have hitherto avoided wireless, it is rather astonishing to see it arrive at its greatest development at the hands of practical operating engineers. The modest, unassuming Mr. Carty is coming in for a vast amount of newspaper attention, which, no doubt, is as embarassing as it is deserved. It is, apparently, his year. To open the transcontinental line, be elected president of the American Institute of Electrical Engineers, and give the world this marvelous power to talk across vast spaces is enough honor for a twelvemonth. But there is one more way in which he might have served humanity. J. J. Carty should be a member of the Naval Advisory Board of Inventions. For, if we mistake not, wireless telephony will play a considerable part in future warfare.

Advertising In Telephone Directories

A FEW weeks ago we received from an Independent telephone company in the state of Iowa a copy of its latest subscribers' directory. It was a neatly printed book, altogether pleasing in appearance. But it carried no advertising—and an accompanying letter boasted of the fact.

No doubt a certain number of operators, like this one, believe it unethical to carry advertising in a telephone directory, and so leave it out. Probably a good many more take advertising because it helps pay the printer's bill, but feel ashamed of it. But the majority of operators, we think, regard their directories as good advertising media for local industries, and get all the "copy" they can. And there is no logical objection to this attitude.

If advertising were a thing undesired by the people, admitted only on sufferance and because it is paid for, there might be virtue in refusing it. But that is not true. The people like advertising. They read it. Obviously, if they did not it would hold no value for the advertisers.

If a telephone subscriber wants to call the grocer, the hardware man or the theater, the

number is a good deal easier to find if it is advertised on a full page, or even if the name be merely set in blacker type than its neighbors. For this service the advertiser pays and is satisfied. But it is also a service to the subscriber, for which he pays nothing and with which he is pleased. Furthermore, by virtue of the advertisement he gets better telephone service; for the operating company has a little more revenue, and so can put a little more money into operating.

We have seen how one company, at least, declines to accept any advertising for its directory. Let us examine the opposite extreme.

Not so very many years ago, it is said, President Vail of the American Telephone and Telegraph Company discovered an item in the company's annual report whose significance had hitherto escaped him. The item was "revenue from advertising in directories of subsidiary companies, $780,000"—or to that effect. He looked back and found that the item had grown in a few years from about $30,000.

Instantly a new idea was born. The A. T. & T. Co. would sell twelve pages of national advertising to be carried in all directories of Bell telephone companies. A circulation of 7,500,000 copies could be guaranteed and proved. The price would be $50,000 a page!

It was a big figure; but of course there are more than twelve concerns in the country who would think nothing of spending it if its value was evident. And we may be sure all the eligible "prospects" were solicited—by the best salesmen in the world, by telegraph, by telephone, by letter and by personal call. Not one of them could see the proposition at all, though some of them spent some time in studying it.

Of course $50,000 a page was too high in the first place, even for a year's advertising. On the hit-or-miss principle of all national advertising, one dollar per page per thousand per issue (the familiar formula) the price would better have been $25,000, allowing three issues per year. But even against that handicap, we believe it was settled then and there that the big national advertiser will not recognize the telephone directory. Whether he is right or wrong we will not argue now.

But meanwhile the local advertiser is using the local telephone directory and profiting by it. More power to him and to the telephone companies who are successful in filling their directories with his useful and interesting displays.

The Report on the Chicago Independent

ENGAGED by Chicago's city council for that purpose, Engineer K. B. Miller has laid bare in a hundred-page report some more of the unsavory record of the Independent telephone system in that city. Inasmuch as the report is intended for other than telephone men, it is well that Mr. Miller took pains to point out the remarkable success of the automatic telephone in other cities and under less unfavorable conditions. Of course everybody knows there was nothing the matter with the automatic in Chicago, as a telephone system. The trouble was higher up.

Mr. Miller, summing up his observations, makes this conclusion:

> Any attempt to continue the operation of the automatic system as a competing enterprise, either under city or private control, and either with or without interconnection with the system of the Chicago Telephone Company, will not be conducive to better or cheaper telephone service in Chicago.

And he offers the city its choice between two courses: First, to take the property by forfeiture and dispose of it for cash (estimated at $750,000 to $1,000,000); or, second, to permit a sale to the American Telephone and Telegraph Company after providing against undue inflation of the amount on which the Chicago Telephone Company pays dividends.

In either case the salvage value of the plant appears to be the highest hope of those who put their good money into the enterprise. Too bad.

But we do not believe the end of the chapter has yet been written—in spite of Engineer Miller's splendid report. The problem of Chicago's automatic system has not been solved. The continued operation of the plant is hedged about with as many difficulties as ever confronted a telephone company. But we are not ready to admit that it cannot be done.

Joint Convention

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION
INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA

Hotel La Salle, Chicago, December 8-9-10, 1915

At a meeting of the officers of the Independent Telephone Association of America and the National Independent Telephone Association held at the Hotel La Salle, Chicago, October 18, it was decided to hold a joint convention of the two associations December 8, 9 and 10, 1915, at the Hotel La Salle. The National Association had already announced a convention for these dates, and extended an invitation to the Independent Telephone Association of America to join in the convention and make it the greatest and best in the history of telephony. This invitation has been accepted, and the two great national associations have perfected plans for bringing together at this convention representatives of all branches of the telephone industry, and to present a practical program for every man in every department of every telephone plant. This joint convention ought and certainly will bring together the largest number of Independent managers that have ever attended a national convention. The full strength of the industry will be evidenced. Realizing the opportunity thus afforded, all manufacturers and dealers in Independent apparatus and supplies will make more than their usual effort to attract the trade by exhibits and representatives. Everybody will be benefited. Everybody push for the big convention December 8, 9 and 10.

THE announcement featured above immediately suggests that the two big Independent associations have settled their differences, and that an amalgamation is in order as the next step.

William Fortune, president of the Indianapolis Telephone Company, is authority for the statement that the joint convention of the National Independent Telephone Association and the Independent Telephone Association of America is simply the forerunner of the actual amalgamation of the two associations.

A telegram was dispatched to Mr. Fortune reading:

"Does announcement joint convention of two national independent associations mean one association in future? Please wire answer."

Mr. Fortune wired TELEPHONE ENGINEER the laconic reply:

"Yes."

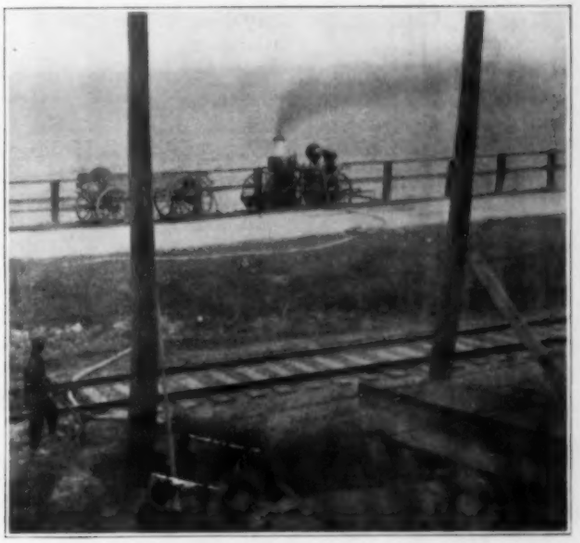
Mr. Fortune, while not a member of either of the Independent associations, always has been recognized as one of the leading Independents of the country. He was present at a meeting held in Chicago on October 18, at which the finishing touches of the coming amalgamation undoubtedly were discussed. And Mr. Fortune, as an Independent, standing on firm grounds between the two associations, is believed to have had a large part in bringing together the two factions which have been working for a common cause along separate lines.

That the amalgamation has been under discussion for a long time is gathered from a letter received from P. G. Holdoegel, secretary and manager of the Central Mutual Telephone Company, Rockwell City, Iowa, a member of the National Independent Telephone Association. He writes that the prospect of amalgamizing the two associations into one body has been worked upon for some time. Mr. Holdoegel concludes his letter with the fervent wish that "we may have a rousing meeting in Chicago in December."

From members in close touch with the situation it is learned that the details of the amalgamation have been worked out with care for the minutest detail in order to make the combined association really representative and a real national Independent telephone association of maximum strength.

Undoubtedly efforts will be made to have the directorate of the combined association represent every section of the country from Maine to Texas and from Washington to Florida, which will mean that many Independent telephone men heretofore apparently not actively identified with either of the associations will be called upon to take an active part in the new organization and it is not impossible that several men who have been very active in the affairs of both associations will be requested to work as privates in the organization, instead of holding places on the directorate as heretofore.

Signaler Bert McCartney, Employe of the Western Electric London House, at Present on the Telephone Staff of the Twenty-first Battalion, Eighth London Brigade, Second London Division of the Expeditionary Force in France. He says, "Our Telephones Are Doing Great Work. Nearly All the Western Electric Fellows Are on the Telephone Staff."—Western Electric News.



G. A. Froguer, Superintendent of the Municipal Electric Light and Water Plant at Gladstone, Mich., Has Discovered a Way to Set Poles in Quicksand. A One and One-half-Inch Water Jet From a Hose Connected to a Fire Engine Hose Is Used. The Jet Displaces the Sand and Permits the Pole to Be Lowered Easily.—Electrical World.

Belgian Advance Patrol Keeping in Touch With Headquarters by Means of a Field Telephone.—From a Story Entitled "The Telephone's Use in Modern Warfare," in the September Number of the Western Electric News.

Using the New Army Buzzer in the Field.

These Three Pictures Show a New Camp Telephone and Service Buzzer Developed by the Signal Corps of the United States Army. It Employes a Small Two-Cell Local Battery, Flashlamp Type, and Weighs Eleven Pounds Complete. The Set Is Contained in a Small Oak Case. It Will Be the Standard Set Hereafter, Replacing the Field Buzzer, Cavalry Buzzer and Field Artillery Telephone.—Electrical World.

New Army Telephone and Buzzer in Use—Walking Away to Lay Conductor, and Method of Reeling Up Wire. Note Ground Rod in Right-Hand Picture.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Illinois Cities Say Rates Too Low

The application of the DeKalb County Telephone Company of DeKalb, Ill., for increase in residence telephone rates in the city of DeKalb and business telephone rates in the city of Sycamore, Ill., has met with an unusual complaint before the State of Illinois Utilities Commission, held in Chicago, October 26. The cities of DeKalb and Sycamore have entered an objection which sets forth their reliance upon the State Commission and its experts to establish the proper valuation of the company's plant, but in view of the present discrimination of its rate schedule, including the practice of free toll, the increase asked for was objected to and a request was made for the establishment of an entirely new rate schedule which will give the company a fair return on its investment, but employing the cost and use factors which may be determined upon by expert investigation.

Acknowledgement was made by the objectors that the company is not now receiving a fair return on its investment and an effort was made to assist the company to arrive at a satisfactory understanding with the commission.

The field investigation of the plant valuation was in charge of A. H. Krom, telephone engineer, and the cities of DeKalb and Sycamore were represented by Garrison Babcock, telephone expert.

The hearing was adjourned for two weeks, at which time it is expected that definite action by the commission will be taken in this matter.

Abuse Long Distance Service

It has taken a long time, but a way has been found to beat the supposedly fraud-proof prepayment boxes of the Bell Telephone Company at Philadelphia, Pa. While many are laughing in great glee over a discovery to make long distances at the sole cost of five cents, telephone officials are working their brains overtime to stop the trickery.

The much abused operator at Central is accused of the slip-up, and strict orders will be issued for them to be vigilant against the jokers who want to call up a number in Cleveland, Chicago, Pittsburgh or some other far off city for five cents. The system is simple, but, according to telephone company officials, it cannot be worked unless the operator is lax. Here it is:

Approach booth nonchalantly, and give a long distance call to Cleveland. Operator states tariff, which is $2.75 for first three minutes. Drop money into various slots. When conversation, whether real or joke, is finished, hang up receiver, but immediately insert nickel and ask for correct time, for which there really is no charge.

Ten to one the operator will give the time, simultaneously pressing mechanism which releases what she supposes is the jitney. Instead, the $2.75 drops into box, and all the telephone company has to show for the service to Cleveland is the nickel.

Mileage of Telephones and Telegraphs in Ecuador

There are 2,926 telephone instruments in Ecuador, of which 2,250 are in Guayaquil, requiring 2,539 miles of wire; the capital invested up to the end of last year was $181,687. At the close of 1914 the National Telephone Company increased its capital from $50,000 to $125,000, the added funds being utilized in installing a modern telephone plant, partly subterranean. The work is being done by the Western Electric Company, with a force of American experts, the contract having been secured in competition with several European manufacturers prior to the war. When the installation has been completed Guayaquil will enjoy a telephone service equal to that in the large cities of the United States.

The telegraphic service at the close of 1914 had 5,384 miles of wire, an increase of 37 miles over the previous year, and 163 offices, through which nearly 400,000 messages were sent. In addition to the wireless station connected with the captaincy of the port, another is being established at Machala, which will soon be in working order, it being the second of a series projected by the Ecuadorian government.

New Telephone Services for Tiehling and Kaiyuan

The Chinese at Tiehling have long been aware that by improving the means of communication between the police stations the operations of brigands might be curbed; also, as the existing telegraphic service cost the merchants heavily, even though their requirements were not met, they hoped that the telephone system, once installed at Tiehling, might be gradually extended to Mukden on the south, to Fakumen on the west, and to Kaiyuan on the north. This plan enlisted the general support of the military, police, mercantile and educational circles, who agreed to bear a share in the funds required and asked the prefect to sign a contract on their behalf. A contract was signed July 24, 1915, for the purchase of more than 60 telephones, a switchboard, and about 70 miles of telephone wires, at the price of $6,500. A Japanese firm at Changchun is supplying these goods, which are coming from Osaka.

The prefect at Kaiyuan, at the suggestion of the Japanese consul, is carrying on negotiations with the same Japanese firm for the purchase of a telephone installation for Kaiyuan at the same price as for Tiehling.

Chicago Telephone Company to Educate Office Boys

A school for office boys, believed to be the first of its kind in the country, has been opened by the Chicago Telephone Company. One hundred and twenty boys, ranging between 16 and 18 years of age, took up books and pencils and began their schooling where they left off when necessity called them to work.

H. F. Hill, vice-president of the company, was the sponsor of the idea.

For years the company has wrestled with the problem of what to do with the office boy when he gets too old. There is nothing it can do but discharge him. He either grows too large to fill the duties of an office boy or too old to accept the wages paid. He is usually unfitted by lack of sufficient education to accept a clerical position.

The company has decided it would be a good plan to train them so as to keep them in the service. The directors have arranged with the Y. M. C. A. to furnish the boys with instructors, and the company gives the time and the books.

The company has fitted up regular school rooms for them and the first classes have already been held. The classes will meet three times a week, from 12 to 2. The clerks have to get along without the boys during these hours as best they can.

The only stipulation the company makes is that the boys devote themselves as earnestly to their studies as they do to their work.

Wireless Telephony Outdistances Wires

Bell Engineers and Government Officers Achieve a Miracle

WITHIN the last year the world has witnessed the greatest known achievements in telephony, with and without wires. One of the latest and most wonderful triumphs of telephonic science comes in the announcement of wireless telephone communication at a distance of 4,900 miles. Previously, distances claimed for wireless telephony varied from a few to several hundred miles.

Therefore, it was with the greatest surprise that the scientific world and particularly the wireless men heard of the official tests made by the American Telephone and Telegraph Company on Wednesday afternoon, September 29, when clear, understandable speech was transmitted without the use of wires from the Atlantic to the Pacific coast. At that moment wireless transcontinental telephony took its place among the great achievements of American telephone engineers and transatlantic telephony became practically assured.

Sitting in the offices of the company at 15 Dey street, New York, President Theodore N. Vail spoke into a Bell telephone, connected by wires of the Bell System with the wireless tower at Arlington, Va., and his words were transmitted by wireless telephony to Mare Island, near San Francisco, Cal. This latest and most remarkable triumph of the telephonic art was under the direct supervision of John J. Carty, chief engineer of the American Telephone and Telegraph Company. He received President Vail's first messages at Mare Island, and replied to them and repeated them back by wire. The demonstration was held by permission of the navy authorities at the radio stations, and the experiments were witnessed and verified by them.

Following President Vail's message, Union N. Bethell, senior vice-president; John I. Waterbury, a director of the American Telephone and Telegraph Company, and Bancroft Gherardi, engineer of plant of the company, also talked into the telephone and were heard at Mare Island and had their words repeated back by Mr. Carty there. Others present were Ex-Senator W. Murray Crane, of the executive committee; General Superintendent A. Stevenson, and O. B. Blackwell and H. P. Charlesworth, engineers.

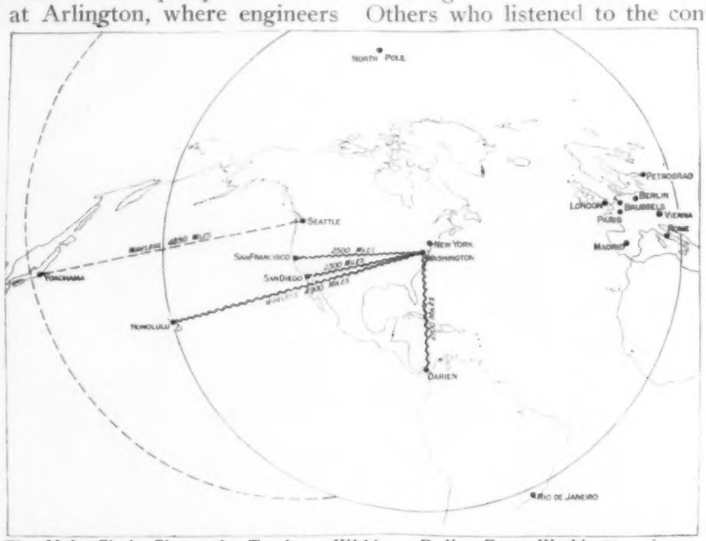
At 12:48 eastern time, President Vail, surrounded by a few officials of the American Telephone and Telegraph Company, picked up a Bell transmitter and called into it: "Hello, Carty; this is Mr. Vail." In spite of the fact that the words went by wire to Washington and then leaped through the air to the Pacific coast, Engineer Carty's reply came back almost instantly: "This is fine; this is wonderful," and the groups of men gathered together at opposite sides of the continent knew that wireless transcontinental telephony would henceforth be numbered among the miracles of modern science. After an extended conversation with Mr. Carty, Mr. Vail was

Talking Without Wires From New York to San Francisco—Group of Officials of American Telephone and Telegraph Company in President Vail's Office in New York. Left to Right—Bancroft Gherardi, Engineer of Plant; U. N. Bethell, Senior Vice-President; F. A. Stevenson, General Superintendent of Plant; Theodore N. Vail, President; K. W. Waterson, Engineer of Traffic; W. Murray Crane, Director; O. B. Blackwell, Engineer; John I. Waterbury, Director; H. P. Charlesworth, Engineer; H. Christopher, Special Wire Man, New York Telephone Company—Courtesy Bell Telephone News.

followed by others present and in all cases the talkers were informed by the listeners at Mare Island that their voices were distinct and recognizable.

The Bell wireless system is not yet fully installed at Mare Island, the receiving apparatus only being in position there; hence, it was impossible for messages to be telephoned back by wireless, but all the messages sent from or by way of the Arlington tower were recorded at Mare Island, and their receipt fully confirmed by the officials in their reports by wire.

During the day a similar and equally successful demonstration took place at Arlington, where engineers of the American Telephone and Telegraph Company, Western Electric Company and officials of the army and navy talked direct to Mare Island by wireless. Within the next twelve hours wonders piled on wonders in wireless telephony and even more marvelous records were made. From the radio station in San Diego came word that the talk from New York had been heard there over the wireless and later on a similar report came from Darien in the Isthmus of Panama. The distance from New York to San Francisco is 2,500 miles, to San Diego 2,300 miles and to Darien 2,100 miles. To have made these records was enough to make September 29 an epoch-making day in the history of science, but a new and greater thrill came to the public when Lloyd Espenschied, an engineer of the American Telephone and Telegraph Company, cabled from Pearl Island, near Honolulu, Hawaii, 4,800 miles from Washington, that he had heard a message from the Arlington tower. Mr. Espenschied had been sent by Mr. Carty to the far-off Pacific island several months ago, carrying with him receiving instruments, and had erected an improvised wireless station on the island. When it is remembered that not only London, Paris and Berlin are nearer New York than Honolulu, that it is farther away than Petrograd and even the North Pole, the magnitude and importance of this accomplishment may be partially realized.



The Main Circle Shows the Territory Within a Radius From Washington of 4,900 Miles, the Distance from Washington to Honolulu Which Was Reached by a Wireless Telephone Message, September 30. The Same Message Could Have Been Heard at a Properly Equipped Radio Tower at Any Point Within the Circle. The Dotted Circle of Equal Radius Shows That a Telephone Message From Seattle Could Be Heard at Yokohama.—Courtesy Bell Telephone News.

The engineers and officials at Arlington had gathered at the station at seven o'clock in the morning and sent many messages to the various receiving stations during the day, reaching the climax of a scientific triumph when Honolulu was reached. In the Arlington party were Captain W. H. G. Bullard, the navy's chief of radio; Colonel Samuel Reber, of the army signal corps; Dr. F. B. Jewett, assistant chief engineer of the Western Electric Company; E. H. Colpitts, research engineer, Western Electric Company; John Mills, J. W. George and W. H. Schott, of the American Telephone and Telegraph Company; R. A. Heising and W. H. Everett, of the Western Electric Company; Lieutenant Commander S. W. Bryant, Lieutenant Commander S. E. Hooper, Lieutenant R. B. Coffman and Lieutenant Bastedo, all of the navy, and P. G. Burton and J. E. Boisseau, of the Chesapeake and Potomac Telephone Company. A number of officials talked direct to Mr. Carty by wireless and were plainly heard at Mare Island. Following the New York demonstration, J. J. Carty, of New York City, chief engineer of the American Telephone and Telegraph Company, officially confirmed the report that Theodore N. Vail, president of the American Telephone and Telegraph Company, seated at his desk in New York City, talked by wireless telephone with Mr. Carty, who was listening at Mare Island navy yard, San Francisco. Others who listened to the conversation at Mare Island were: Lieutenant Commander Sweet, United States Navy; Allen H. Babcock, consulting electrical engineer, of the Southern Pacific Company; Chief Electrician Peterson, of the U. S. Naval Radio Station; H. P. Arnold and R. L. V. Hartley, of the Western Electric Company; A. H. Griswold, H. H. Hamlen and several other engineers and plant men of the American Telephone and Telegraph Company. He stated that U. N. Bethell, vice-president of the American Telephone and Telegraph Company; John I. Waterbury, one of the company's directors, and B. Gherardi, of Mr. Carty's engineering staff, also spoke from Mr. Vail's office by wireless telephone to himself and to the others present with him. Mr. Carty recognized the voices of all of these gentlemen, and exchanged with them numerous questions and answers which were heard at Mare Island.

He also heard a large number of messages from the Arlington station. Words, phrases and sentences were heard from all of those by the listeners at Mare Island, notwithstanding the fact that the "static" disturbances were of an unusually violent nature.

Of even greater significance is the last announcement that the human voice has been successfully projected across the Atlantic, a wireless telephone message having been sent from the government's powerful wireless telegraph station at Arlington, Va., across the river from Washington, and received in the Eiffel tower at Paris.

The same message was received in Honolulu, 4,800 miles from Washington. Operators at both stations reported they could even distinguish the voice of the speaker. This is the first international wireless telephone communication as yet established.

To B. B. Webb, a telephone engineer, fell the honor of being the first man to span with his voice the space between the old world and the new. Sitting in the plant at Arlington, Mr. Webb shortly after midnight asked the wireless telegraph operator to signal the Eiffel tower. The wireless snapped out the signal, and soon there came back a response.

Awaiting word from Mr. Webb at the Paris end

of the wireless radiation were H. E. Shreeve and A. M. Curtis, other engineers, and a group of French officers listening with especially designed apparatus. In Honolulu Mr. Espenschied, a telephone engineer at the Pearl Harbor navy yard, was waiting.

Mr. Webb at Arlington had a transmitting instrument, but no receiving apparatus.

"Hello, Shreeve!" he shouted into the mouthpiece. "Hello, Shreeve!" He then began to count: "One, two, three, four; one, two, three, four. Good-by!"

In the afternoon of the same day the expected cable message came from Paris. It was addressed to the company officers and said that Webb's "hello's" and "good-by's" had been distinctly heard.

At about the same time there came a message from Honolulu saying that Mr. Webb's talk had been understood there in full.

It is said that the system used in the tests is the culmination of several years of painstaking experiments. Early in the spring of this year the system had been developed to a point where good results were secured over a distance of 250 miles, employing for the aerial an experimental tower erected at Montauk Point, L. I., and a small tower in Wilmington, Del. This was shortly followed by tests between Montauk Point and St. Simon's Island, Ga., a distance of 1,000 miles. The engineers to whom credit is due for the success of the system do not lay claim to being inventors. It is admitted that the system is by no means a new, basic invention, but simply the perfection of existing methods; although in the developing of many of the smaller details of the system there have been numerous inventions.

The apparent inauguration of practical wireless telephony gives rise to the question: to what extent will it be employed, as well as what will be its position in regard to the regular telephone system? Thus far the prevailing opinion among telephone and wireless men is that the radio telephone will be a very valuable adjunct to the telephone systems, enabling them to become truly universal in scope. Remote places, such as islands, will be joined by the wireless telephone to the regular systems, and in emergencies the wireless telephones will be available for communication between points when the wire systems fail. To summarize the numerous views on the subject, it is safe to assume that the wireless telephone will find its own niche in the commercial world without altering, but rather increasing, the usefulness of existing telephone systems.

New Observation Telephone System for Warfare

A new selective system of telephony designed especially for use in the trench warfare in Europe has been offered to several of the belligerent governments through their embassies in Washington. By means of the new system, it is claimed, many of the disadvantages of the present field telephone systems now in use are overcome, and observers, instead of being obliged to communicate with the central switchboard operator one at a time, will be able to communicate freely with one another and with any selected or designated point in the field reached by the system.

Up to this time, it is explained, the various observers for the respective armies have been provided with a telephone such as in ordinary use, and which has the disadvantage that they can talk one at a time only with the "battery" or central station. With the new system, it is claimed, the various observers can co-operate to assist one another in locating a particular point, from various angles. That is, three or more observers, if it were possible to train simultaneously their telescopes upon a predetermined point, could without a doubt advise a battery commander as to what was going on at that particular point.

With the new system, it is stated, one observer can be placed in connection with another, through the battery station, or all can be signalled and talked to simultaneously by the battery, or the two to the exclusion of the other observers can communicate as to an objective point. This objective point can then be observed simultaneously from the two points and a definite decision telephoned from each observer to the battery station with the proper instructions as to whether the particular point should be bombarded.

Also, should any one or more of the observers be injured or killed and the telephone set carried by him fall in any position with the receiver on or off the hook, the telephone system is not affected and the battery can communicate with any one of the other observers and connect any two observers for conversation.

This is accomplished by using a single wire extending around the entire zone, with the battery station provided with a selecting or master key, all of the various instruments being connected in series and each provided with a simple instrument that provides for the locking and releasing of the receiver hook or the shunting of the subscriber's instrument from the line, and also the signaling of the selected instrument with any form of alarm, while each instrument is at all times signaled as to whether or not the line is busy.

In the event that the wire is cut by shot or shell, the line at such cut portions dropping upon the ground will immediately complete the circuit, so that the system will not be put out of commission.

Transcontinental Line Cost $620,000,000

Immensely impressive are the facts and figures represented by the new telephone line which makes conversation across the continent possible. The new line, already coming into general use, is carried on 130,000 poles, standing in line across 13 states. One phantom and two physical circuits are established by four copper wires, each .165 inch in diameter, running the entire distance. A mile of this wire weighs 435 pounds, the weight of the line being 5,920,000 pounds. Each physical circuit also has 13,600 of hair-like insulated wire for the loading coils. The Panama canal has cost $310,000,000 during the nine years of its building, while twice that sum, or $620,000,000, has been expended on this telephone line. This transcontinental line is part of a system which has nine million telephones, connected by 21 million miles of wire, serving one hundred million people.

Farmers' Lines Protected

The Iowa railroad commission has ruled that electric companies seeking to secure franchises for the construction of high tension power lines across the country and along the public highways must construct them so as not to damage the telephone lines already built along these highways. Few of the farmers' telephone lines have a metallic circuit and their service is damaged by proximity of high tension wires.

New Insect Penetrates Cables in Savannah

An insect of apparently minute size which has heretofore only been heard of in South America and which attacks the lead coverings on overhead cables has recently made its appearance in Savannah.

In the last two weeks it has caused the management of the Southern Bell Telephone & Telegraph Company no end of trouble. The manager of the telephone company states ten cases of the borers' activity have been found in the last few days and he has invoked government aid to find a remedy.

The borer, the scientific name of which staggers even the experts in the employ of Uncle Sam, in attacking the cable or aerial system of wiring bores a minute hole entirely through the lead covering which protects the groups of telephone wires from the elements. The hole is smooth of edge and cut with the precision of a keen tempered bit in the hands of a skilled artisan. The fabric covering of the individual wires is not disturbed, but rainfall quickly penetrates the cable through the holes made by the insects and the entire group of wires serving dozens of telephone subscribers is short circuited and made useless.

It may be possible to defeat the borer in its destructive career through the scientific treatment of the aerial cables with some death-dealing coating. This is hardly practical as there are miles and miles of the cables strung all about the city and surrounding territory. It is expected that the Washington authorities, to whom the matter has been referred, will offer some course of action which may checkmate the strange new pest which is now causing the telephone experts sleepless nights.

If it proves a difficult matter to secure prompt answers or to get a connection within the next few weeks the borer may be blamed. It is hoped to find some speedy remedy for the latest pest which has made its appearance in Savannah.

Garford Enjoying Excellent Business

From the offices of the Garford Manufacturing Company at Elyria, Ohio, issues the pleasing report that the company is enjoying a splendid business, particularly in its switchboard department. It recently secured a contract from the Ohio State Telephone Company for the installation of complete equipment in three new exchanges that have been established in Cleveland—Madison exchange, Lake exchange and Riverside exchange. The first two named will have switchboard installed of 3,200 lines capacity; the Riverside exchange, 600 lines.

In addition to this the Garford company has been awarded the contract for 6,000 line central office equipment, with all the late Garford automatic service features, by the Texas Telephone Company, Waco, Texas. In addition to these larger contracts, of course, the company is receiving a great many orders for magneto switchboards of smaller capacity. Altogether the Garford people have no reason to complain of the last year's business.

Permits Telephone Company to Trim Trees

The case of the village of Dexter, Michigan, against the Michigan State Telephone Company, in a verdict in favor of the telephone company, presented a case in which an employe of the telephone company was placed under arrest by the village because of his trimming trees within the village limits so that the branches might not interfere with the proper working of the telephone wires. The contention of the village was that the telephone company had no right to trim the trees without first having made satisfactory arrangements to do so with the owner thereof. On the other hand, the telephone company contended that the proper working of telephone wires was a public necessity rather some individual concern's mere desire, and that therefore a reasonable and harmless trimming of trees by a public utility is to be expected if the public is to be properly served, and that the company should be privileged to do such trimming without subjecting itself and its employes to the danger of arrest.

Over a Half Century in Supply Business

Reaching the half century mark of business existence is usually an important event in the history of mercantile concerns. So it was with the Julius Andrae & Sons Company, the large electrical and automobile supply dealers and jobbers. But five more successful years have slipped by since that historical event in the company's climbing career.

Fifty-five years ago Julius Andrae, the founder and president of this monument to Milwaukee's possibilities, with very little money, but an abundance of good health, clean morals and a grim determination to make good, opened a little blacksmith shop on West Water street.

It only required a few years to over-crowd the little shop with work, necessitating the removal of the business to larger quarters. And the business has grown through the succeeding years, requiring four homes to house it, each of which, upon occupancy, was considered adequate for all time.

The present quarters of the company, Broadway and Michigan street, together with its various warehouses throughout the city, and the volume of business the company does, give it rank as one of the largest electrical supply jobbing houses in the entire Northwest.

Boston Serenades San Francisco by Telephone

A chorus of nearly 5,000 employes of the New England Telephone and Telegraph Company in Mechanics Hall, Boston, Mass., sang "America" to an audience of several thousand employes of the Pacific Telephone and Telegraph Company at the San Francisco exposition.

As soon as the applause 3,000 miles away on the Pacific coast subsided, the Californians responded with "The Star-Spangled Banner" and in turn were cheered.

More than 2,500 receivers, one to every two chairs in Mechanics' building, caught the "Star-Spangled Banner" as it was sung in the Telephone building at the exposition and brought the employes of the New England Telephone Company to their feet.

Niles Refuses Merger

The Niles, Ohio, board of trade has declined to endorse the proposition of merging the Bell and Warren & Niles telephone systems, although urged to do so by representatives of the two companies.

The city board decided that it is entirely a matter of individual concern and should not be interfered in by an organized body. There is much protest against the consolidation, it was said, because of its monopolistic character and because of a fear that the excellent service given Niles patrons by the Bell company might not be continued after a merger.

Efficiency in Telephone Service

Address Before the Indiana Independent Telephone Association

BY CHARLES J. MURPHY*

TELEPHONE companies and their plants are like men. Each one of them moves through time towards what we call progressive efficiency and new life, or towards decay and an unfriendly lot of patrons. It is efficient management and service around which most of our public thought and most of our public discussions center.

The progressive telephone management may try to adopt a method that is a mistake, but the aspiration is true and is constant if he searches always among policies, devices and systems to better his plant and service. He, on the whole, has a friendly public and the assistance of the public influence.

A few years ago your business was a fixed plan—a purpose, and no one could get your companies to waver from your laid-out method of service. Now in a well regulated exchange all people are courteous to your customers and you will try any number of routings before you will give up a call for a customer.

Your application of the system of unchangeable rules was followed by rules of service which gave to the patrons the service demanded, and caused the development of your plant parts to meet the demand of man and society, which had proved unworkable under your arbitrary rules or methods.

The secret of success in every business is efficient service and economical management. You have an operating expense which must be met before you can have any return for your labor. This operating expense must be sufficient to give the best service obtainable.

Every telephone company operating a plant, be it ever so small, must and should have its work divided so that some one is responsible for the details of that department. It may be one man in a small exchange will look after most of several departments, but wherever there are a number of men heads of departments meetings should be had often, and these men should discuss the welfare of the plant as a whole, because loss of time through misunderstanding, failure to do things at the right time, and lack of proper connection only shows lack of efficiency and proper organization.

Efficiency was never had in an organization where merit did not prevail over pull. Any telephone company which has its managers or help because they are friends or relatives has a public dissatisfied with the service and unfriendly to the company. Where you have a close relationship existing among the men responsible for conditions in their departments, you have always an organization which helps each one to give the best and therefore the most efficient service.

A large number of the telephone companies have to borrow money for extensions and betterments and for the refunding of debts for earlier investments. You will find it much easier to finance your companies if you have men who merit their places in the departments rather than men who hold their places by pull or relationship to some officer. You need not think you can fool the investor, for he knows how your property is managed and what the public thinks of your service before he buys one of your bonds. Why, just the other day a bond buyer said to me of a utility in Indiana, "Their management is bad, and while their earnings show fairly good, there are too many leaks in the management to buy the bonds unless it is at a large discount."

The directors, managers, executive heads of departments, the plant men, the chief operators, the line men, the trouble men in your companies should get together and figure out how you can give better service for less money. Your supervisor can tell you why a call was lost to you on account of a defect in your plant. Your plant man can tell you about your lines and where they are weak from his end of the service. You, as directors, have a great deal more to do than to try to declare as large a dividend as possible to the investors in your stock. After you have paid your bond interest one of the things you should do is to keep in touch with the real workers. The man who toils with his hands, who executes, can tell you and will, if you will only let him, many things of value to you. It is the man who executes who can tell you how the cost of the work he does can be lessened. Why, I once heard a story of a large packing plant which was killing its animals on the ground floor and drawing the carcasses up to the cooling room by power. The business grew very large and it was no small cost to elevate the meat. One day a helper said to one of the men who directed the great enterprise, "Why don't you build an alley and drive the live stock up and then let the dressed meat down?" Since that time all slaughter houses doing a large business are so constructed.

Each and every man who does his work well deserves credit for his work, so if you want an efficient plant keep in touch with all your men. Have a direct meeting with as many as possible, and especially with all of the heads of the departments; not in a critical way, but in an educational way. Tell each other how defects in each department hinder the best service.

I want to tell each one of you just one thing: I want you to listen, and if there is nothing else in this paper, this I know is one of the things that all successful men must find out. Give your associates and helpers credit for what they do for you. One of the most disgusting things we hear is, "I have done this," or, "I have accomplished that." None of you could be where you are if it were not for your helpers and advisers.

Some one said if one gets one thought worth while out of each book that is read and that thought stays with him and becomes a part of him, the reading of the book has been worth while.

Give to each man associated with you, whether it be a fellow director or worker on the lines, credit for what he does for you. It makes him work for results and not for pay. And after all is finished and the last card is played it is summed up in one word, *result*.

It may be interesting to you to know how government ownership of telephones started and the development. In France and Germany the telephone was first put in operation by the military branch of the government to keep in close communication with the army. It was maintained for this purpose and for a long time was

*Member Indiana Public Service Commission.

used for no other purpose. The maintenance was large and the service was inefficient. The development by the government was slow and only to take care of army business. A little later the public was permitted to use the telephone and lines when they were not used by government officials, and from that start the telephone system now owned by the French and German governments was developed.

Statistics show an average unit cost very much larger than the unit cost of commercial telephones, and the efficiency is bad. The public is interested first in efficient service and secondly in the right cost of such service to it. In no case of investigation of a utility for rate making purposes have I found the public demanding more than efficient service at a living rate. The public expects and wants to pay the telephone company for its service, but objects to paying for inefficient service a price which should procure for it the best possible service. I remember a telephone rate case that the commission completed some time ago, where many patrons of the company said to the commissioner trying the case. "We do not object to the increase of the rate, but we do want the best service obtainable, and we demand courteous treatment from the company. We have had no courteous treatment from the company. We have had no courtesy from the management and can get no satisfaction from the central exchange. We want the proper long distance connections, and if you as a commission give us these things we are satisfied with the increase."

Miller Reports on Chicago Automatic

Kempster B. Miller, telephone engineer employed by the city of Chicago, has recommended the sale of the automatic telephone system to the American Telephone and Telegraph Company. His report was made to the council committee on gas, oil and electric light.

This is the property which the council decided to forfeit to the city several months ago because the company did not have 20,000 bona fide subscribers, required by its franchise. The mayor vetoed the forfeiture and the subject matter was referred to the committee again. Mr. Miller was employed to tell the aldermen what could be done with the automatic telephone property, especially if the city gets it.

According to Mr. Miller's report, if the city acquires the automatic telephone property by forfeiture, the only sure way to make it a real asset will be to discontinue its operation, dismantle the plant and sell it in whole or in part. He estimates that the city in this way could realize between $750,000 and $1,000,000.

On the continued operation of the plant the engineer says further that any attempt to continue the operation of the automatic system as a competing enterprise, either under city or private control, and either with or without interconnection with the system of the Chicago Telephone Company, will not be conducive to better or cheaper telephone service in Chicago. It will tend to lower the possible standard of service, to raise the cost of service and will, in all probability, cause the loss of large sums of money, failing for the lack of public support, he claims.

This conclusion is followed by an argument against the forfeiture of the property to the city. Mr. Miller does not think that the Bell interests would pay more than the salvage value of the plant if purchased from the city.

By the end of the period of years which might be consumed in forfeiture proceedings, the report states further that the commercial importance of the automatic system to the Bell interests would have still further diminished, and this, together with the physical deterioration that would occur, would make the city's chance of disposing of the property after forfeiture proceedings for anything more than its salvage value too remote to count on.

Mr. Miller stated that the commercial situation of the automatic system will grow worse, because its business seems sure to continue on its downward path, while that of the Chicago Telephone Company will probably continue to grow at its present rapid rate.

He claims that every effort has been made by the automatic people to make the business a success, but he refers to it as a "flat failure."

To reproduce the property the report states it would cost $4,508,219 and that this property has a disposal value of $949,689.

The value of this same property to the Chicago Telephone Company he estimates at $1,141,594.

Commenting on the sale price the report says that the price agreed upon, $6,300,000, seems unduly large, but the city is not more than indirectly concerned in what the American Telephone and Telegraph Company pays. The city, however, is very directly concerned in what the Chicago Telephone Company will pay the American Telephone and Telegraph Company for the property, if the price is to affect the telephone rates which the public will pay in the future.

Chicago Passes 00,000 Telephone Mark

Chicago has more telephones than all Italy, Spain, Hungary, Belgium, Portugal, Roumania, Bulgaria, Serbia, and Greece combined. Chicago has more telephones than London and Paris combined; more than Berlin and Vienna combined; more than Asia and Africa combined; more than South America, Central America and Mexico combined.

Thirty-seven years ago a telephone was installed in the office of Monroe Heath, mayor of Chicago. It was the four-hundredth telephone put into service in Chicago.

On September 29, a new telephone was placed on Mayor Thompson's desk and the connections were made. By a peculiar coincidence it proved to be the four hundred thousandth instrument in service in Chicago.

Figures compiled by the Bell company show Chicago now has one telephone for every six inhabitants, the largest number in service in any city in the world, with the exception of New York.

The underground wires which serve telephone subscribers within the city limits, if stretched in a straight line, would extend 1,081,704 miles—far enough to establish communication with Tipperary. In addition, there are 119,527 miles of overhead wires—enough to reach to that celebrated battle ground in France called "Somewhere-in-France."

The company has more than 10,000 employes in Chicago—and 5,000 of them are operators who have nothing to do till tomorrow—excepting to take care of 2,000,000 calls a day. Last year the total number of calls originating within the limits of Chicago was 607,450,000.

Five cents is not an adequate payment to the Chicago Telephone Company for handling a call between opposite limits of Chicago, according to testimony of A. R. Bone, general commercial superintendent of the company, before Commissioner Yates of the State Public Utilities Commission. The hearing was on a petition of the National Brick Company, fifty feet outside the city limits, for the same rate as that granted within the city limits.

Skin Effect in Conductors

Paper Read Before the American Institute of Electrical Engineers, San Francisco

BY A. E. KENNELLY, F. A. LAWS, AND P. H. PIERCE

The results are given of about one hundred series of tests, each covering a range in frequency up to about 5000 cycles per second, on the impedance of long loops of parallel conductors of different metals, sizes, and cross-sectional forms. The measuring apparatus is detailed. The theory of the skin effect in solid rods and in indefinitely wide flat strips is appended in a new and simplified form.

THE following researches were conducted, under an appropriation from the American Telephone and Telegraph Company, at the Massachusetts Institute of Technology in the Research Division of the Electrical Engineering Department, during the year 1914-15. In the early part of 1914, they were carried on under the directorship of Prof. Harold Pender. They date their origin, however, to M. I. T. thesis work undertaken in 1912-13.

Brief Early Historical Outline of Skin Effect Research.—The first mathematical discussion of auto-distorted alternating-current density in a wire appears to have been given by Maxwell in 1873. Heaviside contributed an extensive mathematical literature to the whole subject in 1884-1887. J. H. Poynting also contributed to the mathematics of the subject in 1884-1885. Hughes developed the experimental side of the subject in 1886. Lord Rayleigh in 1886 first gave the formula for skin effect in an infinitely wide strip. Dr. H. F. Weber in 1886, J. Stefan in 1887 and O. Lodge in 1888 contributed further material. Lord Kelvin gave the expression in ber-bei functions in 1889. Hertz in 1889 and Sir J. J. Thomson in 1893 discussed the subject both from the experimental and mathematical standpoints. Mr. J. Swinburne used the term "skin-effect" in 1891.

Current-Distortion Effects.—The phenomena to be discussed relate to distortions in the distribution of current-density over the cross-section of conductors, and may therefore be summed up under the title of *"current-distortion effects."* These effects may be subdivided into three classes as follows:

1. An effect due to disturbance of current density in a conductor due to the alternating magnetic flux linked with the same, as in the case of simple, straight, round wires remote from return conductors. This is the *"skin-effect."* It may be regarded as due either to imperfect penetration of electric current into the conductor, or to the greater reactance of the central core of the conductor with respect to the surface layer; whereby the current density is less on the inside than on the outside.

In a uniform solid round wire, the skin effect is symmetrical with respect to its axis. In solid wires of other than circular form, the skin effect is, in general, dissymmetrical, as might be expected.

2. An effect found in spiralled stranded conductors and due to the reactance of the spirals. This has been called the *"spirality effect."*

3. An effect found in parallel linear conductors of any cross-sectional form when in proximity, owing to the alternating magnetic flux from one penetrating the other. This may be called the *"proximity effect."*

The entire phenomenon of current-distortion effect, including the skin effect as a subtype, may nevertheless be referred to broadly as "skin effect" in conformity with current usage, unless a distinction is called for.

APPARATUS EMPLOYED.

The Mutual Inductance Bridge.—Professor Hughes, on assuming the presidency of the Society of Telegraph Engineers in 1885, delivered an address on "The Self-Induction of an Electric Current in Relation to the Form of Its Conductor." In carrying out the experiments there described, he used a form of bridge, which is diagrammatically shown in Fig. 1. Its peculiarity is that an e.m.f. is introduced into the detector circuit by means of a variable-ratio air-core transformer, or mutual inductance, shown at *m* in the diagram. The detector current can be brought to zero by adjusting the bridge arms and the mutual inductance. In the original paper, owing to an inadequate examination of the theory of this arrangement, the results obtained were misinterpreted. Professor Hughes' paper precipitated a lively discussion, in which Lord Rayleigh, Sir Oliver Heaviside and Professor H. F. Weber participated.

One of the by-products of this discussion was the formulation of the complete theory of the Hughes bridge, by Professor Weber and Lord Rayleigh. Mr. Heaviside also showed that the arrangement used by Professor Hughes was not as simple in its action as that obtained, if the mutual inductance is inserted between either the supply circuit or the detector circuit, and one of the bridge arms. Both the Hughes and Heaviside bridges are shown in Fig. 1. The Heaviside bridge has been employed in all the work here reported.

The conditions for balance in the Heaviside bridge may be deduced thus:

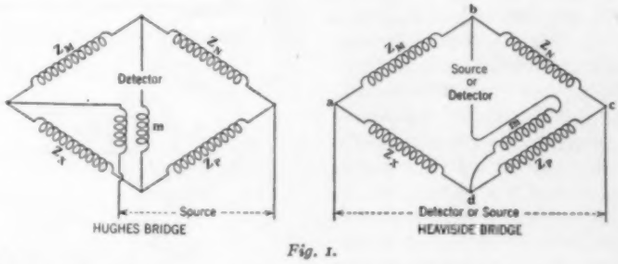


Fig. 1.

The impedances of the bridge arms are denoted by Z and the mutual inductance by m. The r.m.s current in any arm is denoted by I with the subscript designating the arm.

At balance, the currents in the arms M and N are equal, likewise those in X and P.

The potential difference between a and b, reckoned through the arm Z_M, must be the same as that via the arm Z_X, and the detector circuit, and that between b and c, reckoned through the arm N, must be the same as that via the detector circuit and the arm P. Consequently

$$Z_M I_M = Z_X I_X + jm\omega I_X \quad \text{volts} \angle \quad (1)$$

$$Z_N I_M = Z_P I_X - jm\omega I_X \quad \text{volts} \angle \quad (2)$$

(The sign $\angle$ following the unit of an equation indicates that

each side of the equation and every separate term thereof is to be considered as a "complex quantity," or plane vector.)

Therefore

$$\frac{Z_M}{Z_N} = \frac{Z_X + jm\omega}{Z_P - jm\omega} \qquad \text{numeric} \angle \ (3)$$

In these experiments, an equal-arm bridge was used,

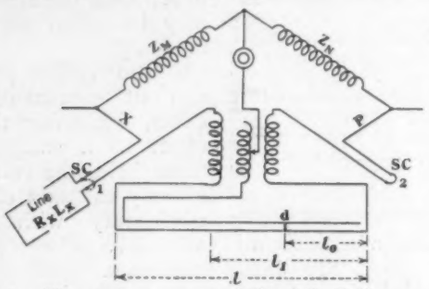


Fig. 2.—Arrangement of Heaviside Bridge.

with reference both to resistance and inductance; so that

$$Z_M = Z_N \qquad \text{ohms} \angle \ (4)$$

and the condition for balance becomes

$$Z_P - Z_X = 2\,jm\,\omega \qquad \text{ohms} \angle \ (5)$$

If R_P'', L_P'', R_X'' and L_X'', are the total resistances and inductances of their respective bridge arms, then

$$R_P'' - R_X'' + j\omega\,(L_P'' - L_X'' - 2m) = 0 \qquad \text{ohms} \angle \ (6)$$

Separating the quadrature components, we have

$$R_P'' = R_X'' \qquad \text{ohms} \ (7)$$

$$L_P'' = L_X'' + 2m \qquad \text{henrys} \ (8)$$

as the conditions for balance.

As we have to deal with small resistances, the most satisfactory method of varying the resistances of the bridge arms is to use a slide wire, as indicated in Fig. 2. Also, to eliminate extraneous resistances and inductances, it is advisable to work by the method of differences, two balancings being taken, the first, with the loop short circuited, the second, with the short circuit removed.

Actual Construction and Arrangement of the Bridge.—To avoid trouble from stray fields, the various fixed coils of the bridge were wound on wooden rings, as indicated at *M, N, X* and *P*, Fig. 3. The turns were fixed in position, by being wound in carefully spaced saw-cuts. Eddy current effects in the mutual inductance (arms *X* and *P*) were avoided by using for the primary winding a conductor made of 90 strands of No. 30 B and S enamelled copper wire (diameter of each strand 0.255 mm.).

The primary winding of the mutual inductance was covered with a layer of tape. A thin, hard rubber ring with equally spaced radial saw-cuts served definitely to fix the secondary winding, which was carefully wound outside of the primary; so that it was spaced as nearly uniformly as possible, the aim being to obtain a uniform mutual inductance per turn. By means of the radial arm, *A*, the number of active, secondary turns can be varied from 0 to 89, by single-turn steps. Values intermediate between those given by two consecutive turns, are obtained by the use of the fine adjustment coil, shown at *F A*. This coil of three rectangular turns, each 2.5 cm. × 3.5 cm., is mounted within the wooden ring, as shown, and in such a manner that it can be rotated about its longer axis, to include a greater or lesser amount of the flux within the primary winding.

The change of mutual inductance due to turning the small coil, from the position of minus maximum to that of plus maximum, is somewhat greater than that due to one turn of the fixed secondary. The head, by which the position of the small coil is read off, is so graduated that one reads directly to tenths of a fixed turn, and, by estimation, to hundredths.

Twisted pairs of wires are used for all connections, and are cleated to the table, so that they occupy fixed positions. The positions of the leads *ef* and *gh*, are fixed with reference to the slide wire. Any induction effects are thus rendered definite, and independent of the position of the telephone, which was used as the a-c. detector. Contact between the slide wire and the lead *ef* is made by a sliding spring clip. The functions of the switches shown in Fig. 3 are as follows:

By means of S_1 either direct or alternating current may be supplied to the bridge.

S_2 is a mercury switch, with ample contacts, by which the arms *M* and *N* may be reversed.

S_3 allows either the galvanometer or the telephone to be used as a detector, for d-c. and a-c. bridge balances, respectively.

S_4 reverses the terminals of the secondary winding of the mutual inductance.

In order to cover the entire range of the loop resistances in these experiments, it was necessary to use two different slide wires. Each wire was arranged together with its lead, *ef*, on a meter stick, so that the change from one to the other could be effected with little trouble. To avoid any indefiniteness due to contacts, the joints at the ends of the slide wires were always soldered. Table I gives the data of the slide wires used.

Check measurements of standard resistances and inductances were made at different times with the testing apparatus to make sure that it was in good order.

TABLE I. SLIDE-WIRE DATA.

Slide wire number	Gage B. & S.	Material	Resistance ohms per cm. $\frac{k}{2}$	Change in inductance by moving slider 2 cm. $\frac{\mu}{2}$ abhenrys
1	8	German Silver	0.000280	8.9
2	11	German Silver	0.000810	8.2

Change of inductance per turn of the mutual inductance winding. K = 1342 abhenrys per turn.

The Loop of Conductors Under Test.—The conductors under test were arranged in a single long loop, with parallel slides. They were placed out of doors, about four meters from the ground, and rested either on glass

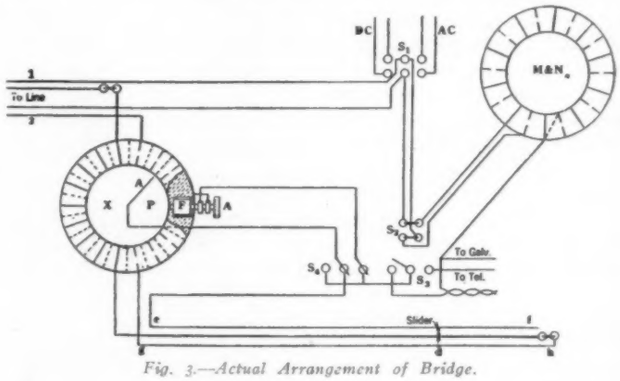


Fig. 3.—Actual Arrangement of Bridge.

insulators or on dry wooden supports, as occasion offered. By the use of tackles, the wires could be drawn taut, their positions being thus rendered definite. Fig. 4 is from a photograph of the loop, taken from one end of the alley. Fig. 5 (which is not drawn to scale) shows the arrangement of the line terminals. The short links

allow the line to be transferred from position *1* to position *2* in the bridge, see Fig. 3. The link, mounted on the spring, is for the purpose of short circuiting the line, as above mentioned. Its action is controlled at the observer's position in the testing room by the use of the electromagnet *M*.

The observations are made as follows: The test loop is connected by the mercury cups to the bridge leads *1* (Fig. 3), while the bridge leads *2*, are short circuited. Two sets of readings are then made, first with direct and then alternating currents; one set with the line shore circuited, and the other with the short circuit removed. The ratio arms, *M* and *N*, are then reversed and the readings repeated. The line is then transferred to the other side of the bridge; that is, to the leads *2*, while leads *1* are short circuited, and four more sets of readings are taken. The arithmetical mean result, given by the various sets of readings, is used in the computation.

During the balancing, the frequency is determined by the arrangement later described. A typical set of readings is shown in Table II. The theory of the a-c. bridge balance, applied to the actual construction, is given in Appendix I.

TABLE II.

Sample of a set of observations and calculations at one frequency in determining the skin effect of the No. 0000 solid copper wire, spaced 60 cm. between conductors.

Using Slide Wire No. 1.

Temp. deg. Cent.	Freq.	Arms	l_0'	l_1'	n_0	n_1	l_0	l_1	$l_1'-l_0'$ cm.	l_1-l_0 cm.	n_1-n_0 turns
25.6	1600	I	51.42	84.62	4.32	43.32	53.15	69.22	33.20	16.07	39.00
		II	54.25	88.40	4.47	43.58	58.15	74.35	34.15	16.20	39.11
		III	50.66	18.55	5.28	44.33	52.55	36.60	32.11	15.95	39.05
		IV	53.51	22.12	5.12	44.07	57.56	41.72	31.39	15.84	38.95
									32.71	16.02	39.03

D-c. Resistance $R = k(l_1 - l_0)$ (A)
$= 0.00056 \times 16.02 = 0.008972$ ohms

Skin Effect Resistance Ratio $\frac{R'}{R} = \frac{l_1' - l_0'}{l_1 - l_0} = \frac{32.71}{16.02} = 2.042$ (B)

Total Inductance of Loop $L = K(n_1 - n_0) + \mu(l_1' - l_0')$ (C)
$= 1342 \times 39.03 + 8.9 \times 32.71$
$= 52378 + 291 = 52669$ abhenrys

CALCULATION OF INDUCTANCE OF LOOP.

In the calculation of the inductance of the rectangle of conductor, the following formula was used. It is a slightly modified form of formula 107 by Rosa and Grover in the Bulletin of the Bureau of Standards, vol. 8, p. 155.

$$L = 4a\left[\log_e \frac{2b}{d} + \frac{b}{a} - \log_e \frac{1\,b}{d\left(1+\frac{b}{a}\right)} - \frac{2b}{a} + \frac{d}{a}\right] + C(a+b)$$

$= A + C(a+b)$ (D)

where a = cm. length of rectangle
b = cm. distance between axes of wires
d = cm. diameter of wires
A = abhenrys external inductance
$C = \frac{Li'}{Li}$ = skin effect inductance ratio
$C(a+b)$ = abhenrys internal inductance
L = abhenrys total inductance

In the sample case given above
$a = 2703.6$ cm.
$b = 61$ cm.
$d = 1.168$ cm.
$L = 51082 + 2764C$

At 0 frequency $C = 1$
and $Li = 2764$
At 1600 $Li' = 52669 - 51082 = 1587$ abhenrys
$\frac{Li}{Li} = \frac{1587}{2764} = 0.5742$

Electromagnetic Revolution-Counter.—It was necessary for the observer to work in a soundproof room, distant from the machinery of the laboratory. Therefore, to facilitate the determination of the frequency, which must be measured with precision, the following arrangement was designed and constructed, with the object of determining by means of a stop watch, the time necessary for the completion of a given number of hundreds of revolutions of the generator. The device (Fig. 6) consists of two members,—a contact device which closes a circuit at the completion of each one hundred revolutions of the generator shaft, and a device for properly pressing the catch of the stop watch. Fig. 6 is a schematic diagram of the apparatus.

The contactor is at *CW*. It consists of a worm and

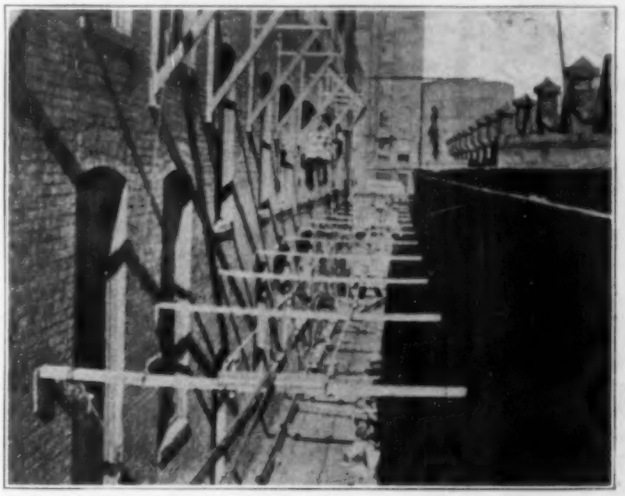


Fig. 4.

wheel, with a ratio of 100 to 1. The wheel carries an arm which, once every revolution, completes the circuit between *a* and *b*. The magnets M_1 and M_2 are thus energized. The gearing runs in a grease box, and a simple coupling *K*, permits of its ready attachment to any machine. The function of the magnet M_2, is to press the catch of the stop watch. The watch, being set at zero, on the first contact after closing the switch, *S W*, the armature A_2 is drawn down, and the stop watch is started. As A_2 moves down, the latch S_4 slips over it, and holds it in the depressed position. This prevents the succeeding contacts from stopping and restarting the watch. At the initial, and at every succeeding contact, the magnet M_1 is energized, and, by means of the ratchet spring S_2 advances the wheel *R W* one tooth, in opposition to the spring S_1. S_3 is the retaining pawl, which bears so heavily on *R W*, that it also serves as a brake, and prevents sudden impulses of M_1 from advancing *R W* more than one tooth at a time. After a definite number of contacts determined by the position of the pin *P*, the arm R_1 engages with S_4, and allows the armature A_2 to rise. At the next contact, the armature is again depressed and locked. The watch is thus stopped at, say, the completion of 1,000 revolutions of the generator. Further operation of the device is then prevented, for the arm *R* is arrested against the spring, S_2.

The resetting is accomplished by depressing the lever *L*. The springs S_2 and S_3 and the latch are thus lifted, and spring *S*, returns the arm *R*, to the dotted position. At the same time *S W*, makes contact, M_2 is energized, and the watch reset to zero.

Detectors.—The range of frequencies covered was from 60 to 5000 ~. A pair of head telephones were used as the detector, both for direct and alternating currents. The telephones were sufficiently sensitive for the frequency range of from 200 to 5000 ~. At 60 and with direct currents, the arrangement shown in Fig. 7 was used to increase the sensitivity. A telephone transmitter is inserted in the detector circuit. Immediately in front

of it is placed a hand telephone, which is traversed by a current from a 700-cycle generator. It therefore emits a loud sound. The low-frequency current in the detector

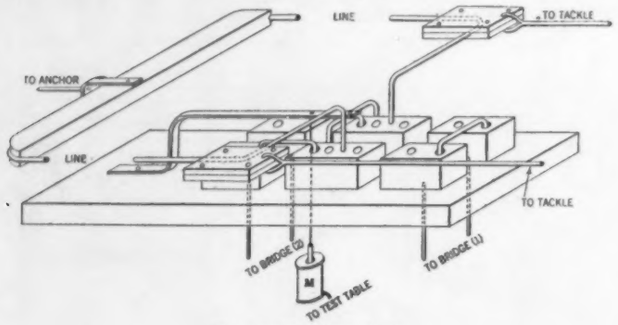


Fig. 5.—Line Terminals.

circuit is thus broken up into alternations of that frequency and the effective sensitivity of the telephone to low frequencies is greatly increased. This device is set up in a distant room, and is properly muffled, so that it does not disconcert the observer.

Generators.—To cover the range of frequencies, from 60 to 5000 ~, three motor-driven a-c. generators were employed; (1) for 60 ~, a Mordey machine which forms a part of the regular equipment of the laboratory; (2) for the range 200 to 700 ~, a small motor-generator set, originally designed for telephonic work; and (3) for the range from 1000 to 5000 ~, a high frequency generator capable, at full speed (3750 rev. per min.), of giving 10,000 ~.

In all cases, speed variations were obtained by the use of resistances in series with the armature of the d-c. driving motor.

The waves of alternating current supplied by these generators to the Heaviside bridge were fairly sinusoidal. Although faint harmonic tones could often be detected in the observer's telephones, there was no difficulty in balancing the bridge to the fundamental tone.

TESTS ON ROUND SOLID COPPER WIRES.

Tests were made on a loop of two parallel copper wires, each No. 0000 A. W. G., diameter 0.46 inch (1.168 cm.), cross-section 1.072 sq. cm., and also on two solid parallel aluminum wires of the same size.

Copper Wires.—The loop of copper wire had a length of about 27 meters, differing slightly in different tests. The wire was provided in lengths of 20 feet (6.1 m.) in selected straight rods. Five tests were made at as many different spacings between the sides of the loop. These spacings or clearances between conductors, were 60 cm., 20 cm., 6.4 cm., 0.8 cm. and 0.03 cm. respectively. Scarfed soldered joints were made between successive rods. The measurements were made in each case at a time of day when the loop was not in sunshine, and when the loop was consequently at a fairly constant and observed temperature. Table III gives the results obtained in these tests, at the spacing of 60 cm. Column I gives the spacing, or the distance between adjacent surfaces of the two conductors in the loop. Column II gives the temperature of the wire, by thermometer observation at one point on the loop. Column III gives the frequency. Column IV gives the total d-c. resistance of the loop between its terminals, in microhms or thousands of absohms. Column V gives the skin-effect resistance ratio of the wire in the loop, as obtained from bridge measurement at each frequency. (In the discussion of skin effect, it is customary to express the conductance effect through the ratio R'/R. For some purposes, however, its reciprocal, the conductance ratio, R/R' is preferable. In this paper the customary expression is given throughout.) Column VI gives the corresponding computed resistance skin-effect ratio by formula (71). Column VII gives the ratio of observed to computed values, as appearing in V and VI, respectively. Column VIII gives

TABLE III.—SKIN EFFECT IN A NO. 000 SOLID COPPER CONDUCTOR OF DIAMETER 1.168 CM.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Spacing between wires cm.	Temp. degrees cent.	Freq. cycles per second	R_{ac} micro-ohms	$\frac{R_{ac}}{R_{dc}}$ observed	$\frac{R'}{R}$ compputed	$\frac{R'}{R}$ observed / computed	L total abhenrys observed	L_i abhenrys observed	$\frac{L_i'}{L_i}$ observed	$\frac{L_i'}{L_i}$ computed
60	23.5	60	8904	1.0038	1.0046	0.999	53,912	2830	1.024	0.9977
	24.2	306	8915	1.111	1.108	1.003	53,767	2685	0.9714	0.9463
	25.0	888	8954	1.587	1.571	1.010	53,143	2061	0.7546	0.7311
	25.6	1600	8972	2.042	2.036	1.003	52,669	1587	0.5742	0.5599
	26.2	2040	8977	2.279	2.261	1.008	52,499	1417	0.5126	0.4959
	27.1	3065	9006	2.694	2.701	0.997	52,215	1133	0.4099	0.4071
	27.4	3950	8990	3.034	3.028	1.002	52,082	1000	0.3618	0.3595
	27.9	5000	9006	3.361	3.371	0.997	51,965	883	0.3195	0.3202

the total measured inductance of the loop, between its terminals, in abhenrys. Column IX gives the total inductance of the loop, within the substance of the wire, after deducting 51,082 abhenrys, the total computed external inductance, including end effect, in the loop. Column X gives the ratio of the internal inductance at each frequency, to the internal inferred inductance at zero frequency (2764 abhenrys) by dividing the entries in IX by

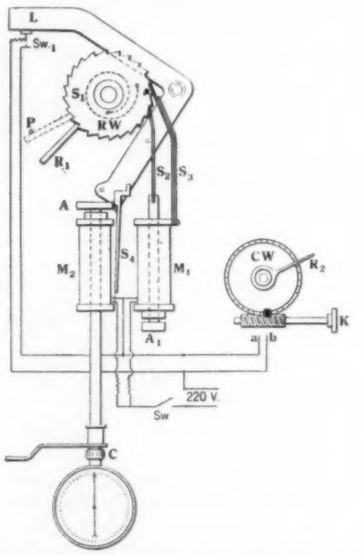


Fig. 6.—Electromagnetic Revolution Counter.

2764. The last column, No. XI, gives the same ratio as computed through formula (76).

It will be seen from Column VII, that the observed skin-effect resistance ratio differs from the computed value by not more than 1 per cent at any of the observations. Also, comparing Columns X and XI, it will be seen that the skin-effect reactance-ratio, as observed, is in satisfactory agreement with the calculated value. The percentage agreement is not so close for the reactances as for the resistances; but the internal inductance, varied by skin effect, is only about 2 per cent of the total inductance measured, and consequently, the changes deduced in this small internal inductance cannot be predicted with the same precision as changes in the total apparent resistance. The results on this loop of solid round copper wires, at 60 cm. separating distance, are therefore in very satisfactory accordance with the Bessel-function theory as developed by Heaviside and Kelvin.

The test was repeated with the sides of the loop brought to a separating distance of 20 cm., by fastening the two wires to the edge of a wooden framework 20 cm. wide, and approximately 27 meters long. The same procedure was followed in the third and fourth tests, the wires being fastened to separating wooden strips at distances of 6.4 and 0.8 cm. apart, respectively. In a fifth test, the wires were separated only by a strip of thin paper, the wires being fastened together over the paper, by insulating tapes at frequent intervals.

The results of the successive tests are recorded in Table IV. At 20 cm. spacing the skin-effect resistance

TABLE IV.—SKIN EFFECT IN A NO. 0000 SOLID COPPER CONDUCTOR.

Spacing cm. between conductors	Temp. degrees centi-grade	Frequency cycles per second	R microhms	$\frac{R'}{R}$	L total abhenrys observed
2.0					
	17.2	60	8640	1.0058	41,874
	15.2	288	8518	1.106	41,698
	15.2	868	8500	1.584	41,099
	15.0	1663	8495	2.120	40,576
	14.9	2061	8512	2.313	40,437
	15.2	3063	8512	2.755	40,202
	15.4	3112	8440	2.781	40,149
	15.3	3860	8440	3.067	40,071
	15.4	5040	8456	3.446	39,910
6.4	18.5	60	8378	1.0087	30,528
	18.9	266	8388	1.100	30,320
	19.3	582	8383	1.354	30,038
	20.4	923	8434	1.640	29,728
	20.7	1465	8411	2.037	29,352
	20.9	2019	8316	2.344	29,108
	21.0	1992	8132	2.322	29,096
	21.0	3028	8132	2.851	28,819
	21.6	3960	8343	3.145	28,688
		5320	8472	3.558	28,546
0.8		60	8612	1.0124	15.894
		239	8612	1.132	15,602
		671	8596	1.604	14,793
	16.3	1068	8618	1.981	14,350
	16.5	1509	8624	2.330	14,007
	16.9	1991	8635	2.643	13,782
	17.2	1988	8602	2.638	13,722
	17.8	2486	8626	2.912	13,560
	18.0	3028	8642	3.179	13,301
	18.3	3880	8642	3.587	13,284
	18.4	4900	8654	3.995	13,127
0.03	21.1	60	8696	1.0172	10,379
	21.4	236	8700	1.244	9,851
	21.5	740	8716	2.231	8,143
	21.5	1000	8735	2.688	7,594
	21.2	1473	8724	3.460	6,889
	21.0	2038	8708	4.272	6,374
	20.9	3058	8716	5,522	5,805
	21.0	3918	8700	6.449	5,558
	21.1	5170	8729	7.512	5,297

ratio does not differ appreciably from the ratio at 60 cm. until the frequency of about 800 ~ is reached. Above this frequency, the ratio rises slightly, but distinctly, above the 60 cm. ratio, and at 5000 ~ exceeds the latter by 2.2 per cent. This increase is to be attributed to proximity effect; *i. e.*, to the effect of the magnetic field from the parallel return conductor.

As the conductors were brought closer, Table IV shows that the skin-effect resistance ratio increased considerably, owing to proximity effect. With the separat-

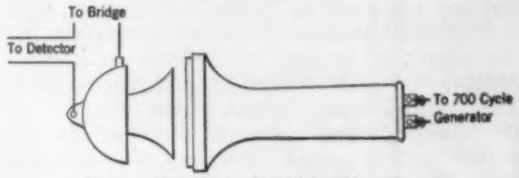


Fig. 7.—Telephone Sensitivity Magnifier.

ing distance of 6.4 cm., the rise in resistance ratio was still hardly appreciable below 800 ~, and only amounted to 3.3 per cent at 5000 ~. With a separation of 8 mm., however, the ratio increased markedly, being 1 per cent extra at 60 ~ and 20 per cent extra at 5000 ~. At the very small separating distance of about 0.3 mm., the ratio was greatly increased, being 1.3 per cent extra at 60 ~, 35 per cent extra at 400 ~, and 119.7 per cent extra at 5000 ~. While, therefore, to the ordinary light-and-power frequency of 60 ~, the proximity between going and return conductors has very little influence on the skin-effect resistance ratio R'/R of these rods, at higher frequencies, the degrees of proximity has a noteworthy effect on this ratio, at separations below 6 cm., as in cabled or flexible-cord conductors.

The ratios of the skin-effect on resistance at different loop widths to that at 60 cm. width are collected in Table V. It will be seen that beyond the frequency of 3000 ~, the ratio of increase due to proximity is but slightly affected by further increase in frequency. Thus, while between 60 ~ and 3000 ~, the effect of bringing the distance between going and returning conductors down to 8 mm. increases the skin-effect resistance ratio from 1.009 to 1.190 times what it would be at 60 cm., and

TABLE V.—SKIN EFFECT IN A NO. 0000 SOLID COPPER CONDUCTOR.

DATA TAKEN FROM CURVES SHOWING RELATIONS BETWEEN SKIN EFFECT AND SPACING OF CONDUCTORS FOR VARIOUS FREQUENCIES.

Frequency cycles per second	Spacing, cm. between wires	$\frac{R'}{R}$ resistance ratio	Ratio of skin effect to that at 60 cm. spacing
60	0.03	1.0172	1.013
	0.8	1.0124	1.009
	6.4	1.0087	1.005
	20	1.0058	1.002
	60	1.0038	1.00
400	0.03	1.590	1.353
	0.8	1.295	1.102
	6.4	1.184	1.008
	20	1.180	1.004
	60	1.175	1.00
1000	0.03	2.688	1.611
	0.8	1.928	1.154
	6.4	1.700	1.017
	20	1.690	1.012
	60	1.670	1.00
2000	0.03	4.210	1.870
	0.8	2.650	1.177
	6.4	2.335	1.037
	20	2.295	1.019
	60	2.250	1.00
3000	0.03	5.450	2.040
	0.8	3.185	1.190
	6.4	2.800	1.048
	20	2.740	1.024
	60	2.676	1.00
4000	0.03	6.530	2.14
	0.8	3.640	1.193
	6.4	3.164	1.038
	20	3.112	1.021
	60	3.048	1.00
5000	0.03	7.380	2.197
	0.8	4.040	1.201
	6.4	3.472	1.033
	20	3.430	1.022
	60	3.361	1.00

further increase in frequency to 5000 ~ only increases the ratio from 1.190 to 1.201.

Fig. 8 shows the skin-effect resistance ratio R'/R for the data contained in Tables I, II and III, with ordinates R'/R and abscissas impressed frequency.

In regard to parallel solid round wires, at 60 cm. separation, Mr. C. P. Eldred, in preliminary work, during 1914, on the same research, at the Massachusetts Institute of Technology, obtained observations over the range between 60 ~ and 5000 ~ of the skin-effect resistance ratio in wires of both copper and aluminum, which check satisfactorily the Bessel-function calculations. The sizes of wire tested were No. 0 A. W. G. (diameter 0.325 inch 0.826 cm., 105,500 cir. mils. 0.5345 sq. cm.), and also No. 0000 A. W. G. (diameter 0.46 inch 1.168 cm. 211,600 cir. mils. 1.072 sq. cm.) in copper and in aluminum.

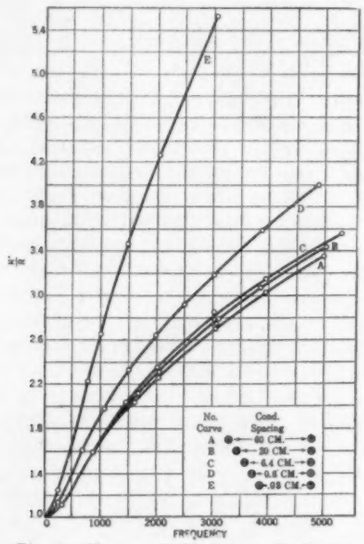


Fig. 8.—No. 000 Solid Copper Conductor. Change of Resistance With Frequency for Different Spacing of Conductor.

While, therefore, the Maxwell-Heaviside-Kelvin theory for solid round wires has been checked within the degree of precision of the observations, both for copper and aluminum, up to 5000 ~, 1.17 cm. diameter, and 60 cm. spacing, very considerable deviations from that theory have been found with closer spacings, owing to proximity effect. This deviation was predicted by Heaviside in 1884. Up to the present time, the authors have not found a formula for skin effect in parallel round wires which will take the proximity effect into account.

(To be continued.)

The Southern Michigan Case

EDITOR TELEPHONE ENGINEER:—Your article in the September issue of TELEPHONE ENGINEER puts the Southern Michigan Telephone Company in such an unjust light that, in all fairness to the telephone industry at large, I am requesting that you publish the following facts:

The Southern Michigan Telephone Company was not absorbed by the Bell Telephone Company and is not owned or controlled by the Bell Company. It did buy the Bell exchanges in the counties in which they operated. It then proceeded to put the exchange that it operated into the highest state of efficiency and on the larger common battery plants installed multiple switchboards of the latest up-to-date patterns and equipped them with all the latest automatic features. These switchboards were purchased of an independent manufacturer and are identical in parts and equipment to the boards in operation by the Ohio State Telephone Company of Cleveland; to the large new multiple switchboard that is being built for the Texas Telephone Company of Waco; to the equipment now giving service to the Peoples Telephone Company of Butler, Pa., and many other points that I can name.

If there is any fact that has been brought home to the independent operator, it is the one that he must have equitable rates, so as to pay the proper charge on his investment. The rates of this company were low and were raised to an equitable base. For instance, the rates for the Coldwater exchange are practically the same as those of the Peoples Telephone Company of Butler, which is a plant of practically the same size. Besides this, the companies had been giving free county service. I have never heard of a telphone company raising the rates without a storm of abuse and disapproval being put forth by its subscribers, and this is exactly what happened with this company. The minute the rates were put into effect, there were a number of "requests for take-out." As a matter of fact the "requests for take-out" ran from 5 to 20 per cent, depending upon the exchange. In the final shake-up, it did not exceed 10 per cent, and in one exchange, in which the number was the largest, over 200 subscribers have ordered their telephones put back.

The statement that the rates are more than double the former ones does not contain a vestige of truth nor does the "Valuation per Station" contain one vestige of truth.

The storm centered around Quincy, which serves a great number of rural subscribers. In this exchange, the Southern Michigan Company had been giving service at $1.00 per telephone and free county toll service. Think of it! The free service was logically discontinued and the rates put on an equitable basis of $1.25 per telephone. As is always the case, there was talk about opposition companies, and the movement was headed by an independent manufacturer. The new company was told that it could reproduce this $40,000 investment, installing 400 telephones and with an underground conduit system, for $9,600. It is not necessary to analyze this statement as any telephone man can draw his own conclusion as to its truth. We understand at a recent meeting this $9,600 price has been increased to $16,000 and is still going up.

An unbiased opinion of the whole controversy can be taken from the commission's report, which was dated July 23, 1915.—THE GARFORD MANUFACTURING COMPANY, GEO. A. SCOVILLE, Sales Manager.

The article referred to in the first paragraph of Mr. Scoville's letter appeared on page 106 of our September number and was taken from the Detroit *Times* and credited to that paper. The report of the Michigan Railroad Commission mentioned in his last paragraph is too long to be published *in toto*. It recites that prior to December 10, 1914, several telephone companies operated in Branch and St. Joseph counties and adjoining territory, duplication was excessive and rates were demoralized. The two stronger companies were the Michigan State (Bell) and the Southern Michigan (Independent). These companies filed application for permission to exchange certain properties, and the smaller companies petitioned to be allowed to sell to the Southern Michigan Company. "The regularly constituted authority of every city and village in the territory affected and approximately three thousand subscribers petitioned the commission to allow the consolidation, evidencing what might reasonably be accepted as the unanimous desire of the public in that territory." Appraisals were made by unattached engineers of good repute as well as by engineers attached to the commission, which gave evidence that the company's rates were unprofitable. Thus convinced, the commission issued the following order:

From all of the foregoing and the further fact that the committee and attorneys for subscribers in opposition failed to show error in the evidence from which these figures are taken, it is the opinion of this commission that a temporary order should issue and the petitioner be allowed to enjoy the benefit of the rates named therein for the term of one year from the effective date thereof.

Telephone Talks

The November, 1915, Installment of an Instructive Serial Course for all Telephone Workers

BY G. W. CUMMINGS AND ARTHUR KNEISEL*

"AT OUR last meeting we heard the Tester talk about transmission losses until the repair men asked for time to let it digest. I wish at this time to offer to him or anyone else the opportunity of asking questions concerning that talk," announced the President as soon as the "discussion hour" had been reached in the order of business.

"I have looked over the record of the last meeting," said the Repair Man, "and I believe I got more out of that talk than I ever got out of anything along the same line. So I believe I have no question at this time." There were nods of approval from several parts of the house and no one offered to open the discussion.

"Thinking that some of you would like to hear something about outside construction work, I requested the Cable Splicer to be ready to tell us how his work is done. Gentlemen, it gives me great pleasure to introduce the Cable Splicer, without whom it would be impossible to operate a modern exchange at this state of the art. When telephony by wireless shall have been developed farther he may have to change his vocation but at present his is a most interesting work."

"Let's cut out the high-brow soft soap. I don't see how we could conduct a modern exchange system without any one of its branches; for if we could, believe me, we wouldn't pay for the operation of that branch," began the Cable Splicer.

"I suppose I had better begin at the beginning and tell you something about the materials with which we work. The lead sheathed cables which are used for underground work come in 100, 200, 300, 600 and 900-pair sizes; the aerial cables are often smaller, running as low as ten-pair. While a few five-pair cables have been installed and even single-pair lead sheathed is used, these can hardly be considered as general practice. Often the smaller cables are used in underground work for connecting buildings directly with the underground cable. For local work the size of the wire in these cables ranges from No. 19 copper paper insulated to No. 22 copper paper insulated. For long distance work we sometimes use as large as No. 10 conductors in our cables."

"Excuse me just a moment," interrupted the Maintenance Clerk. "I saw you working on some cables behind the rack and they did not look like paper insulated to me. Where do they use that cable?"

"What you saw was the silk and cotton covered cable which is used to fan out on the main frame. This cable is not very long but is merely spliced onto the underground at some point not far from the rack. This silk and cotton covered wiring is supposed to be moisture proof. Personally, I believe that it could be made more moisture proof than it is, if the frame end would be boiled out in a trough of hot paraffin before the other end is spliced to the underground cable. Then it might be possible to fasten a suction pump on this end and draw some of the hot paraffin up in under the lead sheath for say a distance of 16 or 18 inches and really seal the cable. It is almost impossible to seal the cable entirely by our present method of boiling out.

"The reason for using paper insulation in cables was mentioned at the last meeting to be for the purpose of keeping down capacity in the cable, for the paper is wrapped as loosely as space will permit so that each wire is really surrounded by an air space. The principal reason for using the No. 22 gauge wire in subscribers' cable is to save space; a larger number of pairs can be put into the same duct space. There are some items which cut down the economy of the very large cables. For instance, in the 900-pair of No. 22 gauge cable, the insulation of the wires is very thin and as the wires are very small it is easy to cause crosses or short circuits while making a splice and these crosses may be in the sheath near the sleeve. The danger of crosses is also increased by the need for close packing in the sleeves. The wire being of such a small gauge naturally breaks very readily. But I think the greatest item affecting the economy of the 900-pair cable is the fact that if we put too many eggs in one basket we may lose many in case of an accident. If water gets into the sleeve of a 200-pair cable, only 200 telephones can be out of order at one time, but if moisture gets into the 900-pair many more telephones are put out of commission.

"To make a straight splice the cables to be spliced are bent into position in the manhole and are first tested out. To do this the end of each cable is opened and the insulation removed from all the wires. Battery is placed on one pair and by crossing this pair with all the rest at one end and testing it against each and every other pair and the bunch against the sheath, it is possible to find whether any two wires are crossed with each other or ground, that is, crossed with the sheath. If there is no trouble in either cable, enough of the sheath is removed from the two ends to be spliced to allow about six or eight inches more than is actually used in the splice. For a 900-pair splice, the ends would be peeled about 28 to 30 inches, for a standard straight splice calls for a 22 inch by a 4½-inch sleeve. However, before this peeling is done the sleeve must be slipped over one of the ends. As soon as the sheath has been removed from the ends of the cable a strip of muslin is wrapped very tightly about the wires for about one to one and a half inches from the end of the lead sheath and the wires are boiled out with paraffin heated to 300 degrees F. This boiling out is begun by first pouring the hot paraffin over the lead sheath for a distance of 6 or 8 inches from where the wires come out. This is done to drive out any suspicion of moisture rather than to drive it into the cable. The boiling out of the wires is then continued toward their ends. A second temporary 'butt' is then made of muslin over the one which had been wrapped tightly around the wires near the lead. These precautions are taken so that a splicer has about two inches outside of the sheath to make a repair in a wire in case one should be broken while working on the splice. The wires are then separated in pairs and temporarily tied in bunches of about 60 pairs toward the back of the splice and 40 pairs toward the front of the splice, being careful to keep the wires in their proper codes. These bunches of wires are then bent out of the way toward the splicer in order

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that he may begin with the back wires of the splice. A cotton sleeve about 3 inches long is slipped over each wire of each pair. We do not use the paper tubes for a 900-pair cable because they take up too much room. The cotton sleeving which is used for this purpose is boiled out in water so that it will be perfectly cleaned and then dried and then boiled out in paraffin. The sleeving as

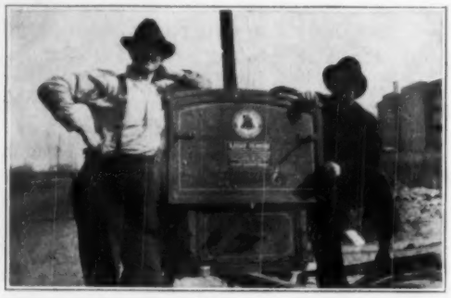


Fig. 75.

well as the muslin which is used in a splice must be handled while the paraffin is still hot.

"Two wires from each cable are then spliced by removing the paper insulation from the wires, twisting the copper ends together and slipping the tube of cotton sleeving over the splice. Of course it is necessary to match up the colors of the two cables so that the pairs will not be reversed. A little slack is left in the first wires, which are spliced, so that the entire splice will be perfectly rounded. The ends of the cable sheath are 19 inches apart and this distance of 19 inches permits the use of four sleeves or tubes. In the completed splice they are not staggered, but are placed in four rows, as experience has shown that it is easier to make repairs if necessary than when the tubes are staggered. After one-third of the wires of the cable have been spliced, it is again boiled out with paraffin. The splice is boiled out the third time after two-thirds of the wires have been connected and a fourth time when all the wires are connected, just prior to wrapping them with muslin. This muslin is wrapped while the paraffin in which it has been boiled is still hot, but the splice is not boiled out after this wrapping."

"Would you mind telling me how you know when

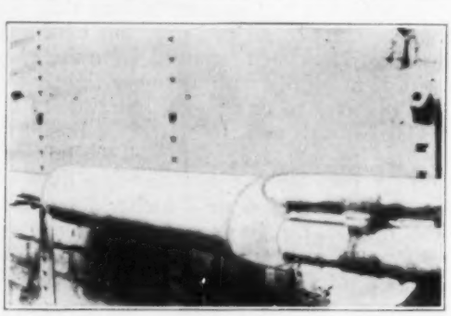


Fig. 76.

the muslin or the wires themselves have been boiled out sufficiently?" asked the Contract Agent.

"The object of boiling out the muslin or the wires is to drive off any moisture which may be in them, for the moisture would sooner or later permit current to leak across the insulation and cause trouble. The paraffin is heated to 300 degrees and as moisture is changed to steam at 212 degrees you can see that the moisture must go. The paraffin itself acts as an insulator. At the present time the company furnishes each cart with a thermometer in order that we may determine this temperature with greater accuracy than we could at one time. If paraffin is heated too hot, it becomes 'short' and breaks very easily damaging the insulator, and if it is burned, its insulation resistance is lowered very much. If it is not heated sufficiently it will not drive off the moisture. It is easy to tell when muslin has been boiled enough. As long as there is any moisture or air left in the muslin it will bubble and seeth and as soon as all moisture and air are driven out this will stop."

"You mentioned something about a second temporary butting of muslin. When is that removed?" asked the Jumperman.

"We take that off from each end just before we put on the last wrapping of muslin which is put over the whole splice.

"After the splice has been wrapped with muslin the ends of the sheath are shaved for about two and one-half inches and the sleeve is slipped into place. The ends of this lead sleeve are then beaten down with a 'dresser' until they touch the cable sheath and are rounded into shape. As much of the sleeve as will be used in making the joints is then shaved to present a bright surface and gummed paper sticker is pasted around the

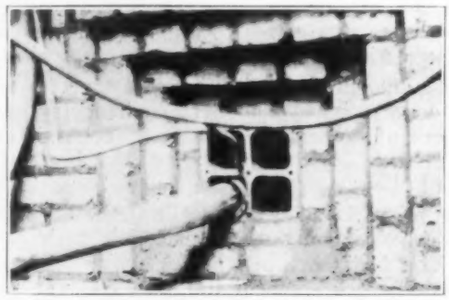


Fig. 77.

cable and around the sleeve to limit the length of the joint at each end, and this part is coated with stearine, which is a compound of stearic acid and tallow. This acts as a flux when the hot metal is poured on the joint. The joint is now ready to be wiped. This is done by pouring a mixture of lead and tin heated to the proper temperature over the joint and then carefully wiping it into place with a wiping cloth."

"What is the proper temperature which you speak of?" asked the Contract Agent.

"That is the one point of splicing which I have never heard explained satisfactorily and it is the point at which skill in the work plays the most important part. The metal is about hot enough when it will scorch a piece of paper stuck into it, but this is not a sure gauge. The condition of the weather plays some part as does the size of the sleeve and even the size of the pot of metal which is being used. If the weather is very cold, the metal must be somewhat hotter in order to heat the joint sufficiently to wipe just right. A good splicer knows when his metal is just right, but he seems unable to tell anyone else how he knows. He has learned the wiping part of his work through the bitter school of burned fingers, joints which later leaked moisture and joints in which he burned the cable sheath, and the best advice he can give to the novice is to learn by the same method. Probably the most important part of wiping is the con-

dition of the metal. Metal which has been once overheated or 'burned' will never make a good joint. Great care must be taken that the metal is free from impurities. If there is more than a small percentage of antimony it will be hard to wipe a good joint. I speak of this because sometimes a helper will put old cable sheath into the metal. Now there is not much objection to having antimony in the cable sheath, for without it the sheath would be so soft as to damage while being pulled through the duct, and the antimony acts as a hardener. Very good results can be obtained from a metal composed of 40 parts of tin and 60 parts of leat. After both joints have been wiped and allowed to cool the gummed papers are removed and the splice is marked with the splicers' initials."

"Just what part does your helper play in this work?" asked the Contract Agent.

"It's up to him to keep the cart in order, to hand me the tools and know just which ones I need next without being told. He must know how to heat the paraffin and metal. He must watch the tools on the job to keep the boys in the neighborhood from appropriating more than half of them and above all he must be ready to take the blame for anything about the work that does not run smoothly while the splice is being made, whether it be due to tools, materials or the temper of the splicer."

"Some truth in that last remark," volunteered the

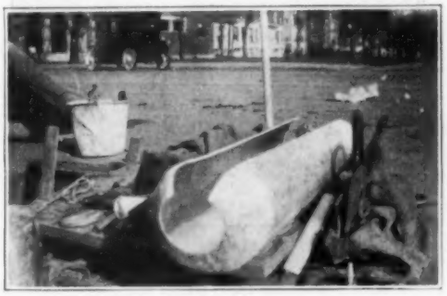


Fig. 78.

Cable Splicer's Helper with a grin. "I have here a photograph of our standard cable cart (Fig. 75). This cart has proved much more economical than the wagon."

"The splice in a cable should be near the middle of the manhole, unless there is a lack of space and it becomes necessary to stagger the splices. After the splice has been completed the cable is supported on the side of the manhole to relieve the cable of the weight of the splice (Fig. 76). The cable is protected at the duct opening by a guard (Fig. 77).

"Sometimes it becomes necessary to open a splice to make repairs and if this splice cannot be closed immediately it should be 'bandaged.' This is done by carefully wrapping the wires with a soft sheet rubber bandage and covering the bandage with tape. If such a bandage is put on carefully it will keep water out for at least 24 hours, although the joint may become immersed during that time. Bandaging should be resorted to only in case of dire emergency and the bandage should be replaced by a split sleeve as soon thereafter as possible. The split sleeve (Fig. 78) is practically the same as the standard sleeve except that it is split lengthwise to allow its being put over a cable that is not in two sections. The split in the sleeve is soldered shut when the joints are to be wiped.

"Y splices are made up in practically the same manner as straight splices. Great care must be taken to prevent unnecessary crossing of wires inside the splice, otherwise the sleeve will not slip into place properly. If we wish to take 50 pair out of a 900-pair cable, we tap in a 600-pair stub on the end of the splice away from the office. Then we can fan out the 600-pair into any number of smaller cables. A somewhat longer sleeve is required for branch or Y work than for straight splicing. For

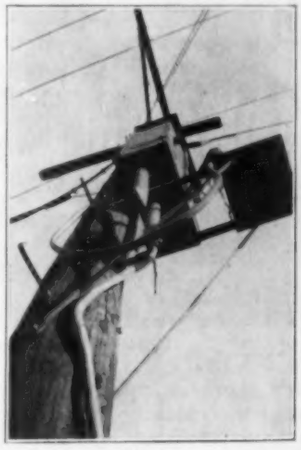


Fig. 79.

instance, a 900 by 900 branch requires a 5½-inch by 24-inch sleeve. Such branches are used in case of cable cuts and not for multiple work. A 900 by 600 stub requires a 5-inch by 24-inch sleeve and a 300 by 300 or a 400 by 400 stub require 4½ by 24-inch sleeves. All Y splices are placed vertically whenever possible (Fig. 76).

"Underground cables at the office end are spliced to the silk and cotton covered cable, these being fanned out to the arrester side of the main frame. As this frame is not over 300 pairs high these leading in cables are never over 300 pair. In installing them a novel stunt is used to effect a saving in cable. As the arrester side of the frame is probably 18 feet high some of the wires of one cable would be 18 feet long, while others would not be over a few inches long from the butt, conse-

Fig. 80.

quently there would be a loss of about nine feet of cable, if each and every cable were run in separately. By running in two cables at the same time and having them looped together at the frame side it is possible to use the long end of a loop for one vertical and the short end of that same pair for the lower end of the adjacent vertical. By this means a saving of about nine feet of cable is effected on each of the two cables. This same stunt is resorted to to economize in pothead wiring at the subscribers' end of the cable. The wires of a pothead which are to be fanned out in the box are always looped in sets

of two pairs. This loop is then cut so that one end is fastened to terminals near the butt and the other end is fastened to terminals at the other end from the butt."

"Will you kindly tell us just what a pothead is and its purpose?" asked the Contract Agent.

"The purpose of the pothead is to give us a waterproof end for the cable through which we can make a connection with the subscriber's line. Much time and

Fig. 81.

money have been spent in trying to find a satisfactory method of ending the cable so that it would be waterproof and not too expensive. Formerly we used a pothead made by connecting rubber covered wire in pairs to the underground wires and slipping a sleeve over the splice. This sleeve was then wiped to the lead sheath of the cable and was filled with a thick insulating compound looking very much like tar. This form of pothead was not entirely satisfactory, probably due to the care necessary in making it up to prevent its leaking moisture. Then there was always more or less trouble due to the tarry compound becoming soft in hot weather. At present we use a patented pothead known as the 'Candee' pothead, but more familiarly known as the 'candy' pothead because of the ease with which it can be used. In this the rubber pothead wires are spliced to a short length of cable and a sleeve is slipped over the splice. This sleeve is sweated to the cable, after the wires at the upper end of the pothead have been wrapped with a tape of thin rubber. The whole pothead is then heated so that the pothead wires and this thin rubber become vulcanized into a solid mass and the insulating compound

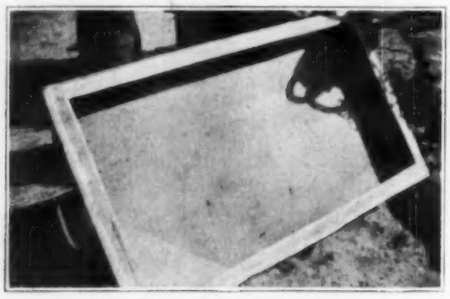


Fig. 82.

cannot leak out. If properly made, this pothead is moisture proof and is desirable particularly in that it can be made up in the factory or the shop and shipped to the job. While the old style pothead was often assembled on the job. Fig. 79 shows the stub of one of these potheads in place ready to connect and a second connected to the underground cable.

"I want to bring out particularly the great care which we are now taking to get the best results. The cables all must test 500 megohms or more per mile to pass inspection. If they fall below this mark there is probably moisture in some section of the cable and it becomes necessary to blow sleeves and boil out until the trouble has been found and cleared. Each cart is supplied with a tent to keep out moisture (Fig. 80). One other point I wish to bring out is the care which the company is taking at the present time to prevent accidents. Each cable cart is supplied with a "first aid to the injured" kit in which there are medicines enough to care for an emergency case and directions for using them. There are also a few surgical instruments so that minor cases of surgery can be taken care of immediately. At present the helper must place his manhole guard over the manhole as soon as the cover is removed and a red flag is kept waving above the opening to warn horses away (Fig. 81). In the congested parts of the city they even supply a flagman to keep constant watch over the manhole as long as it is open. They are beginning to supply the men with goggles to protect their eyes while drilling into brick or stone walls. I notice recently that they are supplying us with drip pans which have a guard rim to prevent the paraffin slopping over while the pan is being carried (Fig. 82). They also supply us with a furnace

Fig. 83.

guard (Fig. 83), which not only protects the furnace from the wind, but also prevents any possible accident due to a flame from the furnace setting fire to the clothes of anyone getting too close to the furnace. There is a rule against taking a lighted torch into a manhole and if this rule is rigidly obeyed there is very little chance of sewer gas causing an explosion. It seems that we have now entered an era of not only Safety First, but Safety All the Time."

"Are there any questions?" asked the President. "If not a motion to adjourn is in order." Motion made and carried.

(*To be continued*)

Bell Protests Against Postal in Ohio

Charging that the Postal Telegraph Company is installing private telephone exchanges in Butler county, Ohio, without first having obtained the necessary permission, the Cincinnati and Suburban Bell Telephone Company has filed a complaint with the State Public Utilities Commission.

The complaint says that the Postal is stringing telephone wires upon its telegraph poles. To install telephones it is first necessary to secure a certificate of public necessity where there is competition in the same district. This is one of the provisions of the public utilities act.

Following the filing of the complaint the commission gave the Postal company until November 1 to file its answer.

MINNESOTA TELEPHONE NEWS

BY THE MINNESOTA INDEPENDENT TELEPHONE ASSOCIATION

326 McKnight Bldg., Minneapolis, Minn.

This department will hereafter contain all Minnesota telephone news and will be edited by the Minnesota Independent Telephone Association, by arrangement with TELEPHONE ENGINEER. Every member of the Minnesota Association will receive TELEPHONE ENGINEER as a part of his membership benefits. It should be noted that this privilege extends even to those companies with less than 100 telephones connected, whose association dues are but $1.00. The regular price of TELEPHONE ENGINEER alone is $2.00.

All communications formerly addressed to "The Message," the association publication superseded by this department, should be sent to the writer at 326 McKnight building, not later than the 18th of each month. All members are urged to co-operate in furnishing items of interest.

E. C. KAST.

REPORTS filed with the Minnesota state treasurer show that eight years ago 168 companies were doing business in the state and reported gross earnings on which $85,000 were collected.

In 1914 there were 1,200 companies doing business with gross earnings on which the state received a tax of $250,000. The Tri-State Telephone Company paid $46,-791.93 and the Northwestern Telephone Company, $108,-723, based on 3 per cent of each company's gross earnings. The smallest amount paid by any company was 11 cents.

The revised list in the office of the Minnesota Railroad & Warehouse Commission now shows a total of 1,756 telephone companies doing business in the state. The increase in companies over last year, plus the increased toll rates since July 1, should increase the 1915 earnings and taxes considerably.

The telephone history of Minnesota had a red letter day when the Minnette-Burrows bill was signed last spring, but the success of operations under the new law will to a considerable extent depend upon the correct understanding of it by the public, telephone companies, the commission and the construction placed upon certain parts of it by the courts of law. Those who were active in the various campaigns for legislation found that one of the most difficult problems to confront was the wording of a bill which would cover the essentials and still not be too long to stand the chance of careful attention of the average legislator. Antagonists would contend that the long bill held too many jokers or it was impossible for the average legislator to give time to the consideration of so much detail, or if the bill was too short, they claimed it was too uncertain in terms and left too much to the commission and courts. The present law was framed, the legislators were convinced, as nearly as possible to contain the essentials, and avoided both the long law and the short law objected to. Few, if any, contended that it was perfect or that perfection was possible, but it did seem to many as a workable law and to present remedies not possible without legislation.

It may be considered a proper object and duty of the association to do publicity work as general information; to specially explain the law and the possibilities for the companies under it and to follow closely the commission's rulings and the legal decisions of the courts. That this may be done more effectually the association needs membership and attendance at annual meetings. Invariably boost the association, and if not a member send in your application at once.

What the Commission Is Doing

The Northwestern Telephone Exchange Company on July 22, petitioned the Minnesota Railroad & Warehouse Commission to enjoin the Minnesota Telephone Company from locating or operating an exchange at Brainerd until it had received the commission's consent as provided by Sec. 13, Chap. 152. The petition shows that in June, 1915, a franchise was granted the Minnesota company by the city of Brainerd, but that no local exchange was properly installed and in operation before July 1, and no rates filed or quoted. It was also believed that the Minnesota company was soliciting and installing telephones without charge under an agreement with its patrons to make no charge until at least 300 telephones were installed and in operation. Also that another exchange in Brainerd would result in great damage to the property of the Northwestern company, as well as cause economic waste, and add to the expense of the telephone service.

A hearing in the above case was held before the commission, July 31 and upon the petition, affidavits and arguments, a decision was rendered, August 14, 1915.

It was shown that the Minnesota company, after its franchise was signed and published, June 12, and accepted on June 21, had plans prepared and submitted to the city as to use of streets and construction of the exchange; that material was immediately ordered and work commenced on June 26, and on June 30 there were 22 telephones installed and working. Since then the construction has continued. Underground work has been practically completed and in all things the company has acted promptly and in good faith.

It was further shown that the Minnesota company had actually solicited and installed telephones without charge under an agreement with its patrons to make no charge until at least 300 telephones were in operation

and that a tariff showing that fact had been filed with the commission.

The commission found, after examining the evidence, that the Minnesota company was not required to secure consent before being permitted to construct and operate an exchange in Brainerd, nor could it give free service to its subscribers at that place.

The commission in referring to the free service stated that Section 11 of the Act controls the question of free service and reads as follows:

A telephone company may furnish service free or at reduced rates to its officers, agents or employes in furtherance of their employment, but it shall charge full schedule rates without discrimination for all other services.

The attempt to give free service until 300 subscribers have been secured is a direct violation of the act. It appeared in the discussion that telephone companies do frequently give free service in an effort to install an exchange until a certain number of subscribers have been secured. This has been considered as a promoting expense. The statute, however, has made that practice impossible. This decision does not foreclose future consideration by the commission of the right of telephone companies to give free or reduced service to the state, municipalities, school houses or public or quasi-public institutions.

PETITION ORDERING THE BELL COMPANY TO CHARGE REASONABLY ADEQUATE RATES FOR ITS SERVICE FURNISHED IN AUSTIN AND CEASE ITS PRESENT DISCRIMINATORY AND UNLAWFUL PRACTICES.

James Keenan of Austin has filed a complaint with the commission claiming that he is a stockholder of the Interstate Telegraph and Telephone Company, which is operating a local exchange at Austin, and that he is being deprived of dividends on his stock because the Northwestern Telephone Company, which also operates an exchange at Austin, is giving free residence telephones with each business telephone and is only charging fifty cents a month for other residence telephones. The complainant states that the furnishing of a residence telephone with a business telephone is unlawful, and that the fifty cent rate is unreasonably low and tends to destroy competition and is prohibited by the Minnette-Burrows telephone law. The Northwestern company has filed an answer to the complaint in which it admits that it is furnishing residence service free of charge in connection with the business telephone in Austin and is furnishing other residence telephones at fifty cents a month. It claims, however, that it is compelled to do so in order to retain its business in Austin, and hence is an effort to maintain competition instead of an attempt to stifle competition. Inasmuch as the Northwestern company has more telephones within Austin than has the Interstate Telegraph and Telephone Company, the answer of the Northwestern Company presents a question of interest to Minnesota telephone men.

No date for hearing in this case has been set by the commission. The Northwestern company had until October 5 to file an answer which it has done. The petition asks for an increase of rates and involves an investigation and it may be some time before a hearing and decision is made.

PHYSICAL CONNECTIONS DEMANDED AT OWATONNA AND THIEF RIVER FALLS.

The city councils of Owatonna and Thief River Falls have each filed a complaint with the Minnesota Railroad & Warehouse Commission asking for a physical connection of the telephone properties in those cities. At Owatonna the Northwestern Telephone Exchange Company owns the local exchange while the Tri-State Telephone & Telegraph Company has a toll switchboard with toll telephones installed about the city. At Thief River Falls the conditions are just the opposite. The Tri-State company owns the local exchange and the Northwestern company serves its patrons only through long distance telephones.

The time to answer the complaint of the council at Thief River Falls has not yet expired, so that it is not possible to say as yet whether a fight will result or not. At Owatonna the Tri-State company has filed an answer stating that it is willing that a connection shall be ordered on reasonable terms and conditions. The Northwestern company, however, in its answer, states that if a connection were to be ordered it would result in irreparable injury to the Northwestern Telephone Exchange Company's system and that such an order, as well as the law itself is unconstitutional because it takes the Bell Company's property without due process of law and without making any compensation therefor. The Northwestern company also claims that public convenience and necessity do not require a connection of the Tri-State toll lines with the Northwestern local exchange at Owatonna.

No date for hearing has been set by the commission in the Thief River Falls complaint, while the Owatonna case is set for November 8. It is stated, however, that Owatonna intends to ask a further postponement of this hearing because of the absence of witnesses.

What authority the Railroad & Warehouse Commission has to issue indeterminate permits and what the practice should be is presented in the following extract of letter from the commission, dated July 21, 1915:

The practice in such cases is regulated by Section 15 of the act, which provides that a telephone company shall receive an indeterminate permit by surrendering its franchise to the municipality by filing with the clerk a written declaration to that effect. Thereupon the clerk shall file with the commission a certificate showing that fact and the date thereof, and it shall then be the duty of the commission to execute an indeterminate permit to the company, the same to be held under all of the terms, conditions and limitations of this act.

Heretofore municipalities acting as agents of the state have issued franchises to telephone companies. The state has the superior authority and may permit a telephone company to surrender its franchise and issue in lieu thereof an indeterminate permit. Where a telephone company complies with the law the commission must execute an indeterminate permit. The law is mandatory. Where the certificate issued by the clerk is proper upon its face the commission need not go behind that certificate to make an investigation. The certificate from the clerk should show the statutory requirements, which are that the company operates under an existing license, permit or franchise and that it has filed a written declaration of the surrender and the date thereof.

The indeterminate permit is not defined in the act. Statutes in other states as well as decisions of the courts have defined such permit to be the right to operate within the municipality for an indefinite period, coupled with a right of the public to purchase the same. When such permit is issued it takes from the local government all the right it formerly possessed to regulate the service and the rates of such company, leaving to it only the power to regulate the location of poles and wires so as to permit no interference with the safe and convenient use of streets and alleys by the public. Questions affecting service and the rates of said companies are vested in the commission. Contracts which had been duly executed between the telephone company and the municipality for the furnishing of any service free or at reduced rates to the public may remain in effect. This is expressly provided by the language in Section 11, which states that, Provided that nothing herein shall release any telephone company from carrying out any contract now existing between it and any municipality for the furnishing of any service free or at reduced rates.

Members of the association can receive, upon appli-

cation, from the association headquarters at Minneapolis, a suggested form of certificate to be used by telephone companies in surrendering their franchises or permits as they may have in order to obtain indeterminate permits.

The following extract of a letter from the commission, dated July 22, 1915, discusses the subject of filing tariffs on or after the first day of July, which in effect change rates that were actually being charged up to and including the last day of June:

Section 5 provides that upon the taking effect of this act it shall be the duty of every telephone company to forthwith file with the commission a schedule of its exchange rates, tolls and charges for every kind of service. Unquestionably the telephone companies had the right to change their rates prior to the first day of July without the interference of the commission, but such changed rates must have been issued and actually in effect before the first day of July. The requirement to file its rates with the commission means such rates as were being charged at the time the law became effective; therefore, the telephone companies must file with the commission the rates that were in effect up to and including the last day of June, and thereafter changes can only be made by and with the consent of the commission. If discriminations appear in the rates so filed they can be taken care of in the way prescribed by the statute.

A discussion showing that the purchase of telephone properties by any other telephone company is unlawful, except by consent of the commission, is offered in an extract of letter from the commission, dated July 21, 1915, follows:

In re-purchasing of telephone companies:

Section 20 of the Telephone Act makes it unlawful for any telephone company to purchase the property or capital stock, bonds or other obligations of any other telephone company doing business within the state without first obtaining the consent of the commission thereto. Telephone companies are permitted to hold stock lawfully acquired before the effectiveness of the act, and where they own a majority of the stock of any telephone company they may purchase the remainder.

Application for the permission to purchase must be made in writing and sworn to by an officer of the company. The application should set forth in precise language the name and organization of the companies interested in the purchase and sale, the exchanges and territory served by said companies, the number of telephones to be affected by the purchase, the fact that the stockholders have legally consented to the sale and the reasons for the purchase. The petition should be accompanied by a blue print or map showing the lines of each of the telephone companies affected.

Upon the filing of such a complaint a public hearing should be ordered and shall be held at the office of the commission. Not less than ten days' notice of such hearing should be given. The notice shall be served by mail upon the officers of each of the telephone companies affected. Copy of such notice should be available for newspaper reporters.

That it is unlawful to charge, demand, collect or receive from any person greater or less amounts for any service rendered by it than it charges, demands, collects or receives from any other person for the same service rendered under similar circumstances, was a subject which the commission decided upon and is presented in the following letter addressed to J. W. Heritage, secretary, Willow Creek Telephone Company, Amboy, Minn.:

Dear Sir:

In your favor of July 16 you state that your telephone company connects with the Northwestern at Amboy; that the toll rate from Amboy to Mankato over the Northwestern is 25 cents, which includes the one-cent Federal tax; that subscribers to your company are given service to Mankato for 26 cents, but on service from Mankato to subscribers on your line the rate is 26 cents Mankato to Amboy plus a toll rate charged by the Willow Creek line of 10 cents, making a total of 36 cents; that the Northwestern refuses to collect this additional 10 cents, claiming the same to be discriminatory under the law.

Section 7 of the telephone act provides that no telephone company shall charge, demand, collect or receive from any person a greater or less compensation for any service rendered by it than it charges, demands, collects or receives from any other person for a like and contemporaneous service under similar circumstances. The commission is of the opinion that the service given a subscriber of the Willow Creek Telephone Company to Mankato is substantially similar to the service given to a subscriber who talks from Mankato to a subscriber on your line, and, therefore, it is discrimination under the law for you to impose a 10-cent charge on an incoming message and make no charge on an outgoing message.

The law does not include connections between exchanges of two different companies within the same municipality or located in different municipalities, was decided and explained in a letter of the commission, dated July 27, 1915:

The commission may upon investigation and hearing order connections made between any telephone exchange system and the telephone toll line or lines of another company, or between a telephone toll line and the exchange system of another company, or between the toll lines of two companies, whenever such connection is practicable and will not result in irreparable injury to the telephone system to be so compelled to be connected. In such order the commission shall prescribe reasonable conditions and compensation.

The determination of the compensation, terms and conditions upon which such connection should be made can only be found after a hearing. The connection permitted under this statute does not include a connection between exchanges of two different companies within the same municipality or located in different municipalities. The powers of the commission as to physical connections are prescribed in the act and they cannot be extended without legislative authority.

In the matter of the application of the Greenwood Prairie Telephone Company to change its rule for the payment of telephone service by rural subscribers from quarterly in advance to quarterly in arrears and to reduce its toll rates from Plainview, Elgin and Millville, the following report was made by the commission:

The commission having considered the petition of the Greenwood Prairie Telephone Company to change its rule for payment for rural subscribers at its Plainview and its Elgin exchanges, which provides that rural service shall be paid for quarterly in advance and if paid on or before the 25th day of the month when due a discount of 25 cents per month will be allowed; to provide that all rural service shall be payable at the end of each quarter and if paid on or before the 25th day of the month when due a discount of 25 cents per month will be allowed for such payment.

Also to reduce its rate for toll service between Plainview, Minnesota and Elgin, Minnesota, from 15 cents for three minutes to 10 cents for three minutes, and between Plainview, Minnesota, and Millville, Minnesota, from 15 cents for three minutes to 10 cents for three minutes.

It was therefore ordered that the request of the petitioner be granted, to take effect September, 1915.

An opinion by commissioner Elmquist to J. W. Howatt, the supervisor of telephones, September 13, 1915, stated that free service could be granted only to persons mentioned in section 11 of the telephone act in a letter as follows:

Construing the opinion rendered by the attorney-general August 5, 1915, you are advised that telephone companies can only give free service to persons mentioned in Section 11 of the act. The railroad anti-pass law has no relation to this subject.

Free or reduced rates can also be given to the United States or the state. This means that the service can be extended to the departments or institutions of the state or government. You are also advised that telephone companies may, and the commission has the power to make a reasonable classification of rates. This must be based upon actual rather than theoretical conditions. Telephone companies have heretofore given reduced rates for telephone service to court houses, school houses, churches and lodges. Until such time as the commission has

had an opportunity to make an investigation of the operating conditions and the cost of the service given to these institutions as compared with the cost of service in the operation of business and residence telephones, the companies will be permitted to classify the service and make reasonable rates therefor.

The Long Prairie Telephone Company has petitioned the commission to raise its present monthly rates from $1.00 for residence and $2.00 for business telephones, to $1.25 for four-party and $1.75 for one-party residence and $2.25 for two-party and $2.75 for one-party business telephones with a discount of 25 cents in each case where payment is made on certain date during the current month.

This increase is asked for on the ground that the Long Prairie Company has recently expended considerable money in converting the plant into a full metallic system, which now represents something like $13,000. The old rates, Jos. Kraker, the owner and manager, asserted before the commission, were not compensative and under the new schedule only a fair and reasonable amount would be realized on the investment.

The commission, realizing the importance of a case of this kind, and being the first one, ordered an official valuation of the entire system, which will to some extent establish rules for valuations in later proceedings where local rates are affected.

The valuation is being made by J. W. Howatt, supervisor of telephones, assisted by H. B. Warren, statistician. Ten days were spent at Long Prairie in making the inventory as complete as possible and included a study of the books. This part of the work was finished October 16, and it will probably be three or four weeks before the valuation is finally completed and in the hands of the commissioners ready for decision.

ASSOCIATION NEWS ITEMS.

At a recent meeting of the executive committee it was decided to hold the next annual convention of the Minnesota Independent Telephone Association in Minneapolis on January 25 and 26, 1916.

The hotel headquarters and arranging of the program was left to the executive agent. Further announcement, giving particulars, will appear in these columns next month. Big plans are under way to make the coming convention a success from every standpoint.

Manager William Wolhuter of the "Tri-State" exchange at Albert Lea is quarantined at his house with small-pox. Both he and Mr. Wolhuter have it in light form and from latest reports expect to be out in the next few days.

The Blue Earth Valley Telephone Company has entered its news exchange headquarters in Blue Earth.

Levi Johnson, secretary of the Watertown Telephone Company, is enjoying a forced vacation. He is serving on the Federal petit jury in Minneapolis.

J. E. Hitch, manager Kandiyohi County Telephone Company, has recently taken a two weeks' trip visiting in Minneapolis and points in Wisconsin.

Mrs. Herman Lueders, wife of the secretary of the association, underwent a serious operation at St. John's hospital, St. Paul, October 19.

Mr. Leuders, who is stopping at the Hotel St. Paul, reports that the operation was successful and the patient doing nicely as might be expected under the conditions.

Commissioners Jacobson and Elmquist have just returned from the Panama-Pacific Exposition, where they went to attend the National Convention of Railroad Commissioners.

The officers and executive agent of the association hope that members will all assist in furnishing "news items" for these columns each month. Help make the Minnesota section interesting by filling in space on a postal whenever something happens of interest, personal or otherwise, and mail the card to headquarters, McKnight building, Minneapolis.

Items received by the 20th of the month will be published in the next issue of TELEPHONE ENGINEER.

Oregon Commission Orders Hotel Interchange

All hotels in Portland, Ore., equipped with telephones by the Pacific Telephone & Telegraph Company and the Home Telephone & Telegraph Company hereafter will be entitled to an interchange of traffic between the two rival systems upon the same basis as is now afforded at the Oregon Hotel.

This order, effective November 1, was handed down by the Oregon State Public Service Commission following a hearing in the cases of the Oregon and Perkins hotels. It is a reiteration of one made some time ago in the Oregon Hotel case but is broadened in scope to include the complaint of the Perkins Hotel officers, who sought like privileges and at the same time takes cognizance of the rights of other Portland hostelries.

Coincident with the ultimatum issued to the telephone companies, the commission severely censures the Pacific system for its tactics in opposing the commission's previous ruling and demands that the Home company at once remove so-called "jack-box" devices installed in a large number of places in Portland to permit the interchange of telephone calls between its lines and those of the Pacific.

The interchange of telephone service ordered, it is specifically set forth, does not apply to any other business than hotels. At the present time there is a case pending before the commission upon complaint of the Public Service League of Portland to force interchange of service between the Pacific and Home systems to every part of Portland.

California Commission to Probe Rates

The California Railroad Commission is going into the details of the business of the Pacific Telephone and Telegraph Company and will make a rigid inquiry into its rates, rules and regulations. The investigation is to be state wide and the first hearing was held in San Francisco, Monday, October 25. To the end that all information on the matter may be obtained, the commission has sent to the several county boards of supervisors and city officials in the state a communication setting forth what it proposes to do; also asks suggestions regarding the telephone system in the various communities and requests the forwarding of any complaints that they may have pertaining to the Pacific Telephone and Telegraph Company.

The commission expects to make a thorough investigation into the entire business of the Pacific Telephone & Telegraph Company, which investigation will take considerable time. After this investigation has been completed, the commission will establish rates, rules and regulations for each local exchange in the state.

Corn Stalks Short Circuit Telephone Lines

The cornstalks are so tall in some parts of Leavenworth county, Kansas, that they are interfering with the telephone service. South of Lansing stalks pressed against the telephone wire and caused a short circuit. The linemen had considerable trouble in discovering what was wrong. The wires were on low poles. Two rows of corn had to be cut on each side to keep the wires clear of short circuiting.

ASSOCIATION NEWS

by THE INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA for
1504 Association Building, CHICAGO, ILL.

BY W. S. VIVIAN

CALIFORNIA

State-wide Telephone Inquiry Coming

An investigation of the telephone situation throughout the state, with particular reference to rates, will be started by the State Railroad Commisson the 25th instant, it was announced here yesterday.

The first step will be the hearing at San Francisco, by Commissioners Thelen and Gordon, of the complaint of the city and county of San Francisco against the rates of the Pacific Telephone and Telegraph Company, and the application of that company for an examination into its rates, tolls, rentals, charges, rules and regulations, and the making of such changes as the commission deems necessary to return a fair interest on the company's investment.

Following the San Francisco hearing, there will be a supplemental hearing in this city, as well as in other cities of the state. The hearings in the two largest cities of the state will be simplified by the fact that the Pacific Telephone and Telegraph Company, only a few months ago, completed inventories of its operative property within the limits of these municipalities. The Home Telephone and Telegraph Company of this city also made an inventory about the same time.

In its application to the commission for a resetting of rates, the Pacific Telephone and Telegraph Company states that, as it reaches practically every locality in the state, the fixing of compensation for service should be based on a valuation of the system as a whole, not on each exchange as an entity.—Los Angeles (Cal.) Times, Oct. 2, 1915.

Telephone Company Need Not Have Franchise

The Pacific Telephone and Telegraph Company is under no obligations to secure a franchise from the city of Fresno to maintain its poles and lines, in the opinion of local attorneys. Failure to secure a franchise before Nov. 3, when the present franchise expires, would not give the city any legal right to order these wires and poles down or confiscate them.

George W. Jones, attorney and member of the board of trustees, said yesterday that the telephone company is permitted to maintain these poles and lines under a federal statute, passed on July 24, 1866, known as the "Post Roads Act," and also under a California statute. The federal statute applies only in so far as this company is engaged in interstate business. In view of the fact that any customer of the telephone company here may telephone to other states, over the lines of this company, he expressed the belief that the federal law would apply here.

Both the federal and California statutes give the right to a telegraph company to build and maintain lines along public highways, providing they do not discommode the public travel.

The United States Supreme Court has held that public highways are streets, highways and alleys dedicated to public use. It has also ruled that in the federal statute, passed before the word "telegraph" appears, it applies to telephones as well.—Fresno (Cal.) Republican, Oct. 7, 1915.

Railroad Commission Issues Review

The State Railroad Commission today made public a report submitted to Governor Johnson covering three and a half years, outlining the work done by the commission and the condition of the public utilities operating in California.

Stocks, bonds, notes and certificates to the amount of $466,000,000 have been authorized by the commission to be issued during this period. Of this, $248,000,000 has been used for improvement and development.

Railroads have spent $135,300,000 of this amount; gas and electric companies, $80,000,000; water companies, $18,500,000; telephone and telegraph companies, $2,500,000, and pipe lines, $10,000,000.

Under the commission's regulation sixteen new railroads, thirteen new gas and electric companies, six new telephone companies, a new $5,000,000 pipe line, more than a score of water companies, and the only independent ferry company on the bay have been launched or completed.—San Francisco (Cal.) Call, Oct. 9, 1915.

Uniform Telephone Rate Is Urged

Adoption of uniform rates for telephone service was declared to be the only solution of the present problem of discrimination by C. A. Reynolds of Washington at the meeting of the National Association of Railway Commissioners yesterday. Reynolds said:

"The gradual regulation of telephones throughout the country will be solved by the adoption of uniform rates and practices under like conditions throughout the United States. Discrimination in rates or service is intolerable and should be eliminated.

Is Without Excuse

"The wide divergence of telephone rates is without justification or excuse, and if regulation does not provide a speedy remedy, the condition will give rise to renewed and more formidable agitation, which will ultimately lead to the governmental ownership.

"Whatever we may say to the contrary, regulaton as to rates and service has not been accepted by the public generally as an answer to the discrimination and extortion on the part of public utilities, and its acceptance or rejection as the final answer depends on the energy with which commissions eliminate conditions of discrimination and extortion intolerable to the public."—San Francisco (Cal.) Examiner, Oct. 14, 1915.

DISTRICT OF COLUMBIA

Against Telephone Rule Change

Permission to formally file, without the holding of a hearing, regulations prohibiting neighbors from using telephones in residences under so-called "unlimited" service contracts, was denied the Chesapeake and Potomac Telephone Company yesterday by the Public Utilities Commission. Under the proposed rule the company would remove the telephones of subscribers failing to live up to the regulation.

The provision objected to by the commission was: "Where the local service furnished at either business or residence rates is not measured, the use of the service is restricted to the subscriber and the agents and representatives of the subscriber."

In a letter yesterday the commission informed the company that it considers the proposed change an alteration of rate schedules, and, therefore, rules that in accordance with the public utilities act it cannot be accepted until after consideration at a formal hearing.

The matter has been the subject of correspondence between the company and the commission ever since the provision was sent to the commission Aug. 17. The commission then refused to accept the provision and the company presented arguments to show why it was not a new item. The decision of the commission yesterday will make necessary the hearing which probably will be requested by the company in the near future.—Washington (D. C.) Post, Oct. 8, 1915.

FLORIDA

Key West Will Have the Automatic Jan. 1

Key West, Sept. 24.—(Special.)—A. S. Metzner, manager of the Automatic Telephone Company, has returned to the city after an extensive visit to the north in the interest of his company. Upon his return he stated that the automatic would begin service on the first day of January next. Work on the building is progressing so favorably that it is now estimated that the roof will be on by Oct. 10 or 15; the orders for the switchboards and other equipment have been placed and these are expected to reach here in time to be installed as soon as the building has been roofed. Meanwhile the erection of the poles and the laying of the conduits are progressing rapidly in various parts of the city.—Tampa (Fla.) Tribune, Sept. 25, 1915.

The Southern Bell Telephone Company has made a reduction in its rates, to take effect Oct. 1, 1915. Business telephones are reduced from $4 to $3 and residence telephones from $2.50 to $1.50. Corresponding reductions on party lines as well as on extensions.—Jacksonville (Fla.) Times-Union, Sept. 28, 1915.

ILLINOIS

Telegraph Wires Basis for System

Announcement that the Postal Telegraph Company will be a competitor of the Chicago Telephone Company in long-distance service within the next sixty days was made today by local representatives of the company.

The change in the service will probably be effective within sixty days at the latest, say officials of the company. It will be the development of an innovation started by the telegraph company in the west some months ago, and gradually developed in other sections of the country. If the plans are perfected, as the officials claim, the telegraph company will be-

Group of Independent Operators Attending the Operators' School Conducted by W. S. Vivian Last Month at Kittanning, Pa.

come a competitor of the telephone company in long-distance service.

Plan Dual Use of Wires

According to the plans, a Joliet operator may be clicking off a telegram to a Chicago operator while another Joliet citizen is talking to a Chicago friend at the same time over the same wire. A system of transposition will enable the company to permit the dual use of the wires at the same instant.

The rates will be cheaper than that of the telephone, it is announced. The difference in the rate is expected to bring the company considerable business, despite the fact that the patrons will be obliged to go to the offices of the telegraph company to use the service.—Joliet (Ill.) News, Oct. 19, 1915.

ILLINOIS

DeKalb County Telephone Company Pays Small Dividends to Stockholders

The DeKalb County Telephone Company has been seeking to raise its rates in Sycamore from $24 to $30 per year for business phones, and from $15 to $18 for selected two-party lines and from $21 to $25 for individual residence phones in DeKalb. The company has appealed to the Illinois State Utilities Commission and at the hearing in Chicago last week some startling evidence was introduced by the attorneys and experts for the company.

The company presented evidence showing that the value of their property is as follows: Cost of reproduction or physical value, $418,799. In addition, the valuation of McMeen & Miller of the "going business" is $41,045; working capital, or cash on hand, $11,434; total exchange property value, $471,287; toll line value, $23,306. Total value company's property, $494,587.

The appraisement of the company's property has been made after long research by Mr. Burgess, telephone expert of the State Commission, and Kempster B. Miller of McMeen & Miller, employed by the company.

The testimony showed in last week's hearing that if the increased rate is granted by the State Commission the company will be realizing but 2½ per cent on its total investment, and this fact is greatly surprising to the general public, many people seeming to think the telephone business is all profit.

Former Governor Richard Yates of the Utilities Commission, stated that never before had telephone statistics been so clearly demonstrated to him.

Under the foregoing conditions, it may be very probable that the State Commission will grant the prayer of the company and give the right of the increased rates in DeKalb and Sycamore, and if the earnings total amount to 2 1-3 per cent profit it may not be illogical to look for a raise in rates in other parts of the county in the near future.—Gary (Ind.) Tribune, Oct. 14, 1915.

INDIANA

Awards Decision to Rochester Company

Charles A. Edwards, of the Public Service Commission, acting as umpire, agreed on by the South Bend Home Telephone Company and the Home Telephone Company of Rochester, in the controversy regarding the ownership of toll lines, today decided that the Rochester company owned toll lines extending from Argus, Ind., through Fulton county, to the north boundary line of Cass county, and the decision also ordered the South Bend company to pay $1,750 to the Rochester company for tolls and other charges collected and kept by the South Bend company.

The controversy originally was placed before the Public Service Commission as a whole, and Commissioner Edwards was sent to take evidence in the case. He found the questions involved in the matter were not covered by the commission's jurisdiction under the public utility law, and then the two companies asked the commission to investigate the problem and act as an umpire in the situation.

Finding that the Rochester company owned the property in question and should repay the amount named, Commissioner Edwards gave the South Bend company the right to pay $250 of the amount within ten days and the remainder at the rate of $100 a month. Of the total amount $1,000 was due, the commissioner found, because of proceeds of toll messages on parts of the line in controversy that had not been specifically covered in the early agreement between the two companies, under which tolls collected for calls originating in South Bend and Rochester were kept by the company in each city. The remaining $750 was due the Rochester company because of revenue from leased wires to the Associated Press and kindred organizations, Commissioner Edwards found.—Indianapolis (Ind.) News, Oct. 15, 1915.

Council Will Not Put City Into a Lawsuit

The city council in special session last night passed a resolution declining to use the city funds to finance litigation against the proposed increase of telephone rates.—Logansport (Ind.) Tribune, Sept. 23, 1915.

WISCONSIN

Telephone Company Files Petition Under 1915 Law

Madison, Wis., Oct. 14.—(Special.)—The Cross Plains Electric Company of Cross Plains on Thursday filed a petition with the State Railroad Commission asking that it issue an order requiring the Black Earth Telephone Company of Black Earth to reconstruct its telephone line between Black Earth and Cross Plains, so as not to be interfered with by a high tension electric wire running between Black Earth and Cross Plains and owned by the Cross Plains Electric Company. This is the first petition filed under chapter 61 of the laws of 1915.—Milwaukee (Wis.) Evening Wisconsin, Oct. 14, 1915.

Chicago Hearing to Help Decide Telephone Case

Testimony now being taken in Chicago in connection with contracts existing between the Central Union Telephone Company and the Western Electric Company will be considered by the Wisconsin Railroad Commission in deciding the Bogard case, according to a letter received Thursday from the commission by Max Schoetz, Jr., assistant city attorney.

Minority stockholders in the Central Union Telephone Company are seeking to compel an explanation of a $32,000,000 debt owed by that company to the Western Electric Company.

It is claimed that equpment purchased from the Western Electrc Company cost $20,000,000 more than it could have been purchased for elsewhere.

The Central Union Telephone Company is affiliated with the American Telephone and Telegraph Company in a manner similar to the relations existing between the latter company and the Wisconsin Telephone Company.

Both the telephone companies are under contract to purchase all their equipment from the Western Electric Company.

Attorney Schoetz, who represented the city in the Bogard case, in which an attempt is being made to secure lower telephone rates in Milwaukee, believes the testimony taken in the Chicago case may have an important bearing on the local situation.—Milwaukee (Wis.) Leader, Oct. 7, 1915.

Telephone Rate Increases Granted

Madison, Wis., Sept. 25.—The Railroad Commission authorized the Bangor Telephone Company to increase its rates 10 per cent. The commission authorized the Cuba City Telephone Exchange Company to increase its rates for business service from $6 to $8 a year.—Milwaukee (Wis.) Free Press, Sept. 26, 1915.

WEST VIRGINIA

To Raise Telephone Rates

Charleston, W. Va., Oct. 14.—Application was made to the Public Service Commission today by the Western Pendleton Telephone Company to increase its service rates.—Wheeling (W. Va.) Intelligencer, Oct. 15, 1915.

MINNESOTA

Deny Telephone Connection

The application of the O. K. Telephone Company of Martin county for physical connection with the Grygla Cooperative Telephone Company of Grygla was denied today by the Railroad and Warehouse Commission.

The O. K. company recited that it has a line to the farm of Arne Buck and from there wanted to use the lines of the Grygla company. The commission ruled that a circuit should be built from the farm of Arne Buck to Grygla. The O. K. company wanted the physical connection that a doctor from Grygla, sixteen miles away, could be called.—St. Paul (Minn.) Dispatch, Sept. 23, 1915.

Telephone Convention Here

The Minnesota Independent Telephone Association will hold its annual meeting in Minneapolis, Jan. 25-26, according to word received today at the Civic and Commerce Association. The convention will have about 500 delegates, representing independent companies in the state and over the northwest.—Minneapolis (Minn.) News, Sept. 30, 1915.

OREGON

Home Telephone Plant to Be Inventoried for Service Commission

Salem, Ore., Oct. 9.—Convinced that an investigation of the rates and practices of the Home Telephone and Telegraph Company is necessary that an intelligent ruling may be made on an application asking for a physical connection in Portland, between its system and that of the Pacific Telephone and Telegraph Company, the Public Service Commission announced today that it had called upon the Home Telephone Company for full information as to its capitalization, earnings, expenses, fixed charges and a complete inventory of all property used in its service.

More than a year ago the commission launched a similar investigation of the rates and practices of the Pacific Telephone and Telegraph Company, and the company has had a large force of men preparing an inventory, and compiling data on its Oregon properties for the commission. The work is said to have been in progress continuously for a year, and to have required the services of an average of sixty engineers and assistants.

Recently the Public Service League of Portland filed a complaint with the commission against both the Pacific and Home companies, alleging that their services were inadequate and unsatisfactory, and asking that a physical connection be ordered between the two systems in Portland. It was this that prompted the commission at this time to make a full investigation of the Home company. The inventory of the property must show the original cost, the reproduction cost, and the amount of the accrued depreciation.—Portland (Ore.) Telegram, Oct. 9, 1915.

Telephone Raise Granted

Salem, Ore., Oct. 8.—(Special.)—An order increasing the rates of the Creswell Telephone Company, because they were found after inquiry to be insufficient to cover expenses of operation, was made today by the Oregon Public Service Commission. The order is dependent upon the company's providing its patrons with a 24-hour service.

The new rates follow: One-party business, $2.50 a month; two-party business, $2 a month; one-party residence, $2 a month; two-party residence, $1.75 a month; four-party residence, $1.50 a month; switching service for farmer line subscribers, $4.50 annually.—Portland (Ore.) Oregonian, Oct. 9, 1915.

Deposit for Use of Telephones Ended

Salem, Ore., Oct. 1.—(Special.)—Abolition of the $5 advance deposit heretofore exacted from its subscribers by the Pacific Telephone and Telegraph Company was ordered today by the Oregon Public Service Commission, except in the case of metered service. The new rule set forth by the commission will go into effect November 1. The order is the result of an exhaustive inquiry prosecuted by the commission on its own motion through several months into the regulations of the company.

Hereafter subscribers may obtain flat rate service by payment in advance for service for a period not exceeding that for which bills are regularly rendered by the company. The present practice in this respect is one month.

The commission requires that the company may not discontinue service until 15 days after the subscriber has been served with written notice in cases where the bill is rendered monthly, and 30 days must be allowed following notice when the bill is rendered for periods in excess of a month.

Deposits Are Limited

Hereafter applicants for metered service for residences will not be required to pay more than $2.50 to insure payment, nor more than $5 for business or commercial metered service. Should the applicant fail to pay his telephone bill, the company is authorized to apply the deposit on his account.

Under rules to be prepared by the telephone company and submitted to the commission for its approval, not more than $2.50 may be charged for discontinuing and reconnecting exchange service, provided that the company may elect to charge the same directly to the resuming customer in event he applies for the same or a lower class of service at the same or other premises within six months after such disconnection, or such cost may be merged in the general operating expenses.

Guarantees Are Specified

A subscriber making application for metered service, where prepayment collection devices are not used, may establish credit either by making a cash deposit or furnishing a guarantor for the payment of the bill. If he has paid all his telephone bills promptly during the 12 months prior to Nov. 1, or if he is owner of the premises to be served, that is considered sufficient guarantee.

All extensions within the corporate limits of a city or town must be made at the company's own expense. Should disputes arise they are to be referred to the commission for adjudication.

Except as provided in the order, the telephone company cannot demand a deposit from any customer. It must refund to customers who demand the same, 30 days after the order

goes into effect, or thereafter, and deposit made heretofore to guarantee payment for telephone service, provided all bills are paid. The commission retains jurisdiction as to all matters embraced in the issues set forth and other than those not determined.—Portland (Ore.) Oregonian, Oct. 3, 1915.

MISSOURI

Bell Telephone Officials Argue for Higher Rates

Jefferson City, Mo., Oct. 7.—Officials and counsel for the Southwestern Telegraph and Telephone (Bell) Company argued today their motion for rehearing upon the original application to increase their rates, and filed additional evidence in support of their modified increased rates, recently submitted under the order of the commission.

The commission held in rejecting the first rates filed that they were exorbitant, but that the company was entitled to some increase in rates.

Accordingly the company filed a new schedule of rates, in which the unlimited telephone service was fixed at $108 a year, this being an increase of $30 over the present rate and $12 under the first increased rate proposed. The commission thought $96 reasonable.

The other rates filed by the company were satisfactory to the commission.—St. Louis (Mo.) Globe-Democrat, Oct. 8, 1915.

Reopens Joplin Telephone Case

Jefferson City, Mo., Oct. 6.—A number of citizens of Joplin, through their attorney, Frank H. Lee, Monday filed an application as intervenors in the matter of the city of Joplin against the Home Telephone Company of Joplin. They ask the Public Service Commission to make, on its own initiative, a valuation of that portion of the plant of the Home Telephone Company devoted exclusively to local service in Joplin so the question of a permanent increase of rates to the company may be equitably determined.

In an order issued January 1, 1915, following an agreement under which the Home company and the Bell Telephone Company consolidated at Joplin a temporary increase on local telephone rates in Joplin was granted by the commission.

The intervening petition, filed today, which is signed by T. W. Cunningham, A. P. Clark, C. W. Lyon and two dozen other citizens, alleges that since the consolidation the service provided by the Home company has been poorer than when the Home and the Bell both maintained exchanges.

It protests against the increase in rates being made permanent until there is a physical valuation made of that part of the plant used exclusively in the local service, and asks that this be done by the commission.

The petition was taken under advisement.—St. Louis (Mo.) Republic, Oct. 7, 1915.

MONTANA

Ask for Dissolution of Telephone Company

Papers for the dissolution of the Helena Automatic Telephone Company were filed in the District Court today. It is set forth that the corporation was organized under the laws of Montana and that at the meeting of the stockholders held Aug. 31, 1914, the dissolution was authorized by unanimous vote. It is also set forth that all claims and demands against the corporation have been fully paid; that the corporation is no longer the owner of any property and has made complete distribution of all its assets. John F. Davis and Thomas J. Davis of Butte are the attorneys for the corporation.—Helena (Mont.) Record, Oct. 15, 1915.

KENTUCKY

Insisted on Placing Pole

Frankfort, Ky., Oct. 14.—The Eastern Kentucky Home Telephone Company insisted on placing a guy pole and rod in such a way as to obstruct the sidewalk in front of Hatcher Bros.' store on Main street in Pikeville, and as a result lost its franchise, or rather, discovered after nine years' enjoyment that it never had one.

The Hatchers secured a mandatory injunction, requiring the removal of the pole and rod, and the company, owned by N. Starkey, filed a motion before Chief Justice Miller to dissolve the injunction. The whole court sat on the motion and it was overruled. Chief Justice Miller said, referring to the law of the case:

"Under section 3636 of the Kentucky statutes, which provides that no ordinance or resolution granting a franchise shall be passed by the city council on the day of its introduction nor within five days thereafter, nor at any other than a regular meeting, an ordinance creating a franchise, introduced into the city council of a city of the fifth class on April 2, 1906, and passed by the council at the same meeting, was invalid, and the purchaser of the franchise under the ordinance so passed acquired no franchise rights.

"Where a municipal ordinance creating a telephone franchise was introduced into the council on April 2, 1906, and passed by that body on the same day, it was invalid and was not cured by a subsequent ordinance, of substantially the same purport and effect, introduced into the council on May 7, 1906, and passed on that day."—Louisville (Ky.) Courier-Journal, Oct. 15, 1915.

Telephone Case Decided

Frankfort, Ky., Oct. 12.—The Court of Appeals today reversed the Logan Circuit Court in the case of the Fidelity & Columbia Trust Company against Oscar M. Smith, master commissioner. The latter was allowed $500 for the sale of property of the Central Home and Russellville Home Telephone companies, for which the trust company secured a decree on a $40,000 mortgage.—Louisville (Ky.) Post, Oct. 12, 1915.

Somerset to Offer Sale of Telephone Franchise

Somerset, Ky., Oct. 9.—A special session of the Somerset city council will be held Monday evening, at which time a new telephone franchise will be offered for sale. The Gainesboro Telephone Company, whose franchise shortly expires, offered one to the body recently, but was turned down when it was learned the company was seeking to raise rates all over the city.—Louisville (Ky.) Courier-Journal, Oct. 10, 1915.

Merchants See Menace

Information that the Home Telephone Company of New Albany is soliciting subscribers in the territory west of Jeffersonville, including Midway, coupled with the announcement that the company has filed a petition with the Board of County Commissioners, asking that it be allowed to run its wires to the homes of subscribers in the McCulloch neighborhood, has excited some disquietude among merchants of Jeffersonville, who see the commercial intercourse of Jeffersonville with this part of Clark county menaced if the residents shall be served by a telephone company that gives service to New Albany and not to this city.

Several years ago the Home Telephone Company of Jeffersonville was organized by the independent interests, and a franchise was secured, but no exchange was established, and suit is pending on the company's bond for damages. Many Jeffersonville merchants were in favor of the new company, and say they are not averse to having it enter the city now. However, they say they are not pleased to see it invade territory regarded as tributary to Jeffersonville. It is believed that business men residing in that section having business interests in New Albany are back of the move.—Louisville (Ky.) Herald, Oct. 10, 1915.

IOWA

More Efficient Telephone Service for Iowans

Ames, Iowa, Oct. 18.—Still better telephone service for Iowa is in sight.

Representatives of both the Bell and Independent companies met with the engineering extension department at Ames last week to discuss plans for more efficient state telephone service. Plans were endorsed for the holding of sixteen two-day operators' schools and three two-day plantmen's schools in January.

The operators' schools, which will be attended by both Bell and Independent operators, are aimed solely to increase the efficiency of local and long-distance telephone service in the state. The schools will be held at Mt. Pleasant, Cedar Rapids, Fort Dodge, Creston, Fort Madison, Marshalltown, Le Mars, Centerville, Oskaloosa, Waterloo, Manning, Des Moines, Washington, Mason City, Shenandoah, and Estherville.

The plantmen's schools, which will take up the practical questions of telephone line testing, cable construction and rural line maintenance, will be held at Ottumwa, Creston and Fort Dodge.—Cedar Rapids (Iowa) Gazette, Oct. 18, 1915.

Retain Franchise

In a reply argument filed in the Supreme Court yesterday the city of Fort Dodge entered an emphatic denial of the claim of the Fort Dodge Telephone Company that it can discard the franchise granted in 1898 fixing rates for service.

The city also claims that it is not true as claimed by the company that the people of Fort Dodge are willing to pay rates in excess of the charges fixed in the franchise. It says that the company, by stipulation, was given authority to accept payments in excess of the franchise rates, from subscribers who wanted to pay more. But the patrons of the company have refused to pay the increased rate, the attorneys claim.

Up to Supreme Court

The Fort Dodge case will be submitted to the Supreme Court at the period which opens Oct. 19. Four sets of written arguments have been filed by both sides of the controversy, and oral arguments also will be made. The telephone companies of the state are interested in the fight, as it will determine whether a company can abandon a franchise if the terms of the grant do not prove satisfactory after a period of years.

In 1898, when the Fort Dodge Telephone Company was granted a franchise, the company had an investment of $10,000 in that city. It now has $300,000 invested in the plant in question. The claim of the company is that when the rates for service were fixed in the franchise, it was not thought that the telephone would be used extensively. It alleges that an increase in the number of subscribers increases the cost of operation out of proportion to the added revenue.

Agreed to Increase Rates

In the Fort Dodge fight, the commercial club of that city is said to have agreed to increase rates at a time when the telephone company was facing a proposition of spending $65,000 to improve its plant.

The city authorities, however, say that they did not approve the higher rates. They urge that if the telephone company increases its rates with every increase in capital it will be but a few years until the use of the telephone will become a luxury that but few of the residents of that city can afford.—Des Moines (Iowa) Leader, Oct. 13, 1915.

Can't Ruin Farmers' Telephone Systems

The Iowa Railroad Commission yesterday ruled that electric companies seeking to secure franchises for the construction of high tension power lines across the country and along the public highways must construct them so as not to damage the telephone lines already built along these highways. Few of the farmers' telephone lines have a metallic circuit and their service is damaged by proximity of high tension wires.—Des Moines (Iowa) Tribune, Oct. 5, 1915.

NORTH DAKOTA

More Time to Make Telephone Connection

St. Paul, Sept. 20.—The State Railroad and Warehouse Commission today announced that an extension of time to Oct. 1 has been granted the Northwestern Telephone Exchange Company and the Tri-State Telephone and Telegraph Company in which to answer the petition of the Owatonna city council for physical connection of the two competing lines under the Minette telephone law, enacted by the last legislature after a fifteen-year fight.

The petition, which is the first to be filed under the new law, declares that connection of the lines is a public need. The law places the burden of proof upon the telephone companies and empowers the commission to order connection if, after a hearing, it is found advisable.

It is predicted by some officials that a legal battle will result if the commission orders the connection made.—Fargo (N. D.) Forum, Sept. 20, 1915.

WASHINGTON

Telephone Deposits Are Returned Today

Today is the day set by the State Public Service Commission for the refunding of all $5 deposit fees to subscribers of the Pacific Telephone and Telegraph Company.

Charles O. Myers, manager of the Pacific Telephone and Telegraph Company, could not be reached yesterday to ascertain what arrangements the company had made for the refunding of the deposit fees.

Chairman Reynolds, of the commission, last night said that the company, through its attorneys, had given notice that it did not intend to appeal the case and had agreed to return to the subscribers their deposit fees, or have that amount credited on their accounts.—Seattle (Wash.) Post-Intelligencer, Sept. 27, 1915.

OKLAHOMA

Prior to adjournment, the State Board of Equalization assessed the American Telephone and Telegraph Company $500,000, as against $140,000 in 1914. Transmitters and receivers rented to the Pioneer Telephone Company, that heretofore have escaped assessment, were assessed at $200,000.—Oklahoma City (Ok.) Times, Oct. 4, 1915.

NEW YORK

No Bell Telephones in Spencerport

Spencerport, Oct. 15.—The Bell Telephone Company has removed the instruments from this town, and Bell local service is now a thing of the past. The toll service of the company is now at the hands of all subscribers of the Ogden Telephone Company, as well as the Federal toll lines. The new switchboard for the Ogden company has arrived and is being installed by experts. This company has also put in a new cable in front of its exchange in Union street. Very few towns have the telephone service that Spencerport now has. —Rochester (N. Y.) Democrat-Chronicle, Oct. 16, 1915.

Low Telephone Rates Offered by Seeker of Franchise

The Great Eastern Telephone Company, which figured prominently in the telephone fight nine or ten years ago, has made another application for a franchise, which will come before the Board of Estimate today. The application is signed by De Elbert Reynolds, president of the company, which has offices at No. 2 Rector street.

The company offers a service for business places at from 3 to to 4 cents a message, without extra charge for interborough messages and with a discount of 10 per cent for prompt payment of bills. For residential service rates of $2, $3 and $4 a month are proposed, interborough messages at the same rate as local calls, and a rate of $1 a month for unlimited service in restricted zones.

The company also proposed a flat rate of five cents for all pay station messages, one cent a message for official business of the city and the payment of the legal rate of from $800 to $1,000 a mile for duct space.—New York (N. Y.) World, Oct. 8, 1915.

OHIO

Complains Against Independent Company in Butler County

Columbus, Ohio, Oct. 15.—As representing the Cincinnati and Suburban Bell Telephone Company, Attorney Joseph Heintzman of Cincinnati today filed a complaint with the Public Utilities Commission against the Ohio Postal Telegraph Company. Heintzman alleged that the Postal is installing telephone exchanges in Butler county without having obtained the certificate of public necessity and convenience required for rival telephone companies under the public utilities act. The commission set Nov. 1 as the date for an answer to the Postal.—Cincinnati (Ohio) Enquirer, Oct. 16, 1915.

Give Out Tax Increases

Properties of the fifteen companies comprising the Ohio State Telephone Company have been valued by the State Tax Commission at $14,979,200. The old Columbus Citizens' Home Telephone Company is a part of the Ohio State Telephone system.

The Central Union Telephone Company's properties (Bell) are listed at $15,347,120, an increase of $141,660 over last year, and those of the American Telegraph and Telephone Company (Bell long-distance) are placed at $5,662,-100. The Cincinnati and Suburban Telephone Company (Bell) is placed at $11,036,300, an increase of $404,580, and the Cleveland Telephone Company (Bell), at $7,816,270, an increase of $157,940. Properties of the Central District Telephone Company, which serves eastern Ohio out of Pittsburgh; were placed at $1,584,970, a $209,560 increase.—Columbus (Ohio) Journal, Oct. 8, 1915.

Lawyers Make Talk

Columbus, Ohio, Sept. 27.—This afternoon the State Utilities Commission listened to the legal battle between the representatives of the Hamilton Home Telephone Company and the Cincinnati and Suburban Bell Telephone Company.

The trouble is a recurrence of an old question, the users of the independent telephones in Hamilton seeking to have the state compel the Bell company to provide long-distance service for the independent telephone users in Hamilton, so that they can get in touch with Cincinnati.

The Bell company resists, claiming it can give any telephone user in the Miami Valley connection with Cincinnati under its own contract system, but is under no legal or moral right to supply long-distance connection for a rival company when, by so doing, its own interests and income would suffer.

The legal argument for the independent telephone users was made by Judge Allen Andrews of Hamilton, while Joseph Heintzman of Cincinnati defended the Cincinnati company.—Cincinnati (Ohio) Enquirer, Sept. 28, 1915.

MICHIGAN

Muskegon's $25,000 Telephone Building

Muskegon, Mich., Oct. 10.—The new $25,000 exchange of the United Home Telephone Company in this city has just been completed and the installation of the automatic instruments is well under way. The installation of the telephones in the residences and business houses of the city commenced last week, and unless some unforeseen delay occurs, the system will be in operation by Dec. 1.

The F. J. Stone Contracting Company, which has charge of the outside work, will finish laying the cables this week and a double force of linemen is stringing the wires.

When the new exchange is formally opened Manager Bromely will invite the public to inspect it and experts will explain the operation of the system.—Grand Rapids (Mich.) Herald, Oct. 11, 1915.

Tekonsha War on Telephone Continues

Tekonsha, Oct. 6.—Business men of Tekonsha have presented thier ultimatum to Manager Smith of the local exchange. It is that unless the company establishes a rate of $18 per month to business men and $12 per month to farmers, all the telephones in the stores will be removed within twenty-four hours.

Thirty days was given the signers of the petition to get at least fifty petitioners to have their telephones put in again at the $12 rate, or all the telephones in the stores will be removed. This action was based on a report that the local switchboard is to be discontinued and a charge for service hitherto furnished free be made.—Jackson (Mich.) Patriot, Oct. 7, 1915.

Would Restrict Use of Four-Party Lines

Subscribers to four-party telephone lines in Detroit are being reminded by the Michigan State Telephone Company that they are entitled by their contract to only four calls a day, and that the contract may be canceled if the instrument is used to excess. Complaints that great delay is met almost invariably in getting a party line number are responsible for the circular being distributed among patrons.

Many subscribers are protesting against the threat.

Attention is called by the company to the fact that the time limit for a conversation should be five minutes. Most of the complaints about service are due, it is said, to the fact that party line patrons are constantly making useless calls and engaging in conversations that are prolonged over two or three times the permissible period. Much time is thus wasted by the telephone operators, say the company officials, because, while a patron is being told "the line is busy," the girl could be responding to another call.

The contract between the patrons and company provides that the telephone may be removed if there are more than four calls a day, either incoming or outgoing.—Detroit (Mich.) News, Oct. 7, 1915.

Rural Telephone Men Win Contention

Hillsdale, Mich., Sept. 2.—What is said to be one of the most far-reaching decisions ever handed down by the Michigan Railroad Commission is embraced in an order which was received here Friday by O. J. Cornell, for the complainants, in the case of the Camden Rural Telephone Company and the Reading Central Telephone Company against the Michigan State Telephone Company. Every contention of the complainants was sustained by the commission, including the question of territorial rights, manner of handling calls and rights for independent connections.—Bay City (Mich.) Tribune, Oct. 3, 1915.

KANSAS

Another Telephone War Is Ended

Articles of agreement between the Baxter Telephone Company and the Cherokee County Mutual Telephone Company were filed with the Public Utilities Commission yesterday by E. H. Hogueland, attorney for the Baxter company. He also asked that the commission approve the agreement and dismiss the complaint filed last spring against the Mutual, as the terms of the agreement remove the ground for complaint.

The Cherokee County Mutual, it was brought out at the hearing last summer before the commission, had grown so strong through the county that it had installed an exchange in the town of Baxter and was arranging to sell service to the citizens of that city. The local telephone company complained to the commission that this action took the Mutual out of the mutual class and placed it under the jurisdiction of the commission.

By the terms of the agreement the Mutual will not go into the telephone business in the city of Baxter, but will connect with the local company's exchange. Members of the Mutual will have free service into Baxter; patrons of the Baxter Telephone Company can have connection with the members of the Mutual for 25 cents a month, or by paying 10 cents a message.—Topeka (Kans.) Capital, Oct. 15, 1915.

Corn Stalks Bother Telephone Line

Leavenworth, Kans., Oct. 2.—The corn stalks are so tall in some parts of Leavenworth county that they are interfering with the telephone service. South of Lansing, at Dan Monroe's place, stalks pressed against the telephone wire and caused a short circuit. The linemen had considerable trouble in discovering what was wrong. The wires were on low poles. Two rows of corn had to be cut on each side to keep the wires clear of short circuiting at Mr. Monroe's place.—Topeka (Kans.) Capital, Oct. 3, 1915.

ILLINOIS

Higher Telephone Rate on Long Call Demanded

Five cents is not an adequate payment to the Chicago Telephone Company for handling a call between opposite limits of Chicago, according to testimony of A. R. Bone, general commercial superintendent of the company, before Commissioner Yates of the State Public Utilities Commission yesterday. The hearing was on a petition of the National Brick Company, fifty feet outside the city limits, for the same rate as that granted within the city limits. Yates continued the hearing two weeks. —Chicago (Ill.) Examiner, Oct. 15, 1915.

Favor End of Automatic Telephones' Use

Recommendations which, if followed out, will mean the end of automatic telephone service in Chicago were made in a report presented late today before the city council committee on gas, oil and electric light. The report, prepared by Kempster B. Miller, consulting engineer, was read to the committee by Walter Fisher, recently employed by Mayor Thompson to make an investigation of the automatic telephone system after the city council had passed an order paving the way for forfeiture of the properties of the Automatic company to the city.

The report pointed out that the city has the choice of two courses:

To take the properties by forfeiture.

To permit the sale of the property to the American Telephone and Telegraph Company, with proper safeguards to prevent an inflation of value when that company resells the property to the Chicago Telephone Company.

In discussing the forfeiture proposition, the engineer finds three courses open to the city:

1. The city may operate the automatic system in competition with the manual system of the Chicago Telephone Company.

2. The city may turn over to a grantee to be operated in competition with the Chicago Telephone Company.

3. The city may dismantle the plant and dispose of its component parts for cash or other consideration.

Under the head of forfeiture Mr. Miller makes two divisions:

1. The city may extend the grant of the Chicago Tunnel Company or its successors, permitting that company to work out its own salvation.

2. The city may allow the Chicago Tunnel Company to sell the property to the American Telephone and Telegraph Company for the agreed price of $6,3000,000 for the ultimate use of disposal of the Chicago Telephone Company. —Chicago (Ill.) Post, Oct. 21, 1915.

MARYLAND

Yellott Ends Argument

Osborne I. Yellott, People's Counsel in the investigation before the Public Service Commission of the Chesapeake and Potomac Telephone Company, yesterday closed his argument. Mr. Yellott had been speaking before the commission six days, and the lawyers and telephone experts who heard him say that his presentation of the case fro mthe standpoint of the people was masterly.

Mr. Yellott told the commission that the Chesapeake and Potomac has been earning approximately 7.7 per cent during the last four years. He argued that 7 per cent is ample, and that, consequently, it is possible to effect a material reduction in the rates, especially in Baltimore city, which, he said, has been paying more than its share toward the company's earnings.

After finishing his discussion of the separate phases of the investigation, Mr. Yellott summarized his argument by stating that he had shown that the fair value of the company's property in its present depreciated condition is approximately $10,000,000, when valued by all the tests prescribed by the Supreme Court of the United States.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

Michigan

PETITIONS were filed March 3, 1915, by the Camden Rural Telephone Company, and the Reading Central Telephone Company, complainants, vs. the Michigan State Telephone Company, defendant, and hearing fixed for April 28, 1915, at the office of the commission at Lansing.

In the opinion of F. V. Newman, secretary of the Michigan Independent Telephone Association, the order entered is of great importance as it preserves and perpetuates the independent companies' connections and method of operating where mergers are authorized by the commission.

Testimony and evidence was submitted by the complainants and objected to and contested by defendant; briefs from petitioners filed May 10, 1915, and the answer from the defendant was filed June 18, 1915; followed by supplemental brief from complainants filed June 30, 1915.

The commission after considering all of the evidence ordered the Michigan State Telephone Company to reinstate, establish and continue at its Hillsdale exchange, the same traffic conditions as existed and as were being enjoyed by the complainants prior to the merging of the properties of the Michigan State Telephone Company and the Southern Michigan Telephone Company. The intent of this order is to bring about proper recognition of contract rights, as set forth in the sale of Hillsdale properties of the Reading Central Telephone Company to the Southern Michigan Telephone Company, and also the sale of Hillsdale properties of the Southern Michigan Telephone Company to the Michigan State Telephone Company.

It was further ordered that the Michigan State Telephone Company shall, through its Hillsdale exchange, route all messages received from Independent telephone companies to subscribers of other Independent telephone companies over lines of Independent companies. Also that the Michigan State Telephone Company shall not, through its system of centerchecking or otherwise, unnecessarily retard the messages handled by it for Independent telephone companies.

It was further ordered that the company shall, at its Hillsdale exchange, pass through calls over such circuits as may be designated by the company originating the call, and that at its Hillsdale exchange it shall handle all calls without discrimination or preference, passing through messages to assigned circuits in the same order as received, first in first out, facilities permitting. The order was dated September 29, 1915, and signed by Lawton T. Hemans, chairman, and C. S. Cunningham, commissioner.

New York

The New York Public Service Commission has refused to make a ruling which condemns the telephone as a means for transmitting telegrams. In refusing to order the Western Union to restore its operator in the village of Port Ewen, where it substituted a system of telephoning messages to the Kingston office, an opinion by Commissioner Emmet stated that it is possible when the telephone is employed as a means of forwarding messages for eventual telegraphic transmission that occasional mistakes will occur, but that the telephone is so universally used in this way that the commission would hesitate to make a ruling which in effect condemned a method of handling telegrams so useful, convenient and satisfactory to the public as on the whole this one seems to be. The real situation seems to be that the inhabitants of Port Ewen, a small unincorporated community, somewhat remote from any great center of population, are today enjoying telegraphic facilities practically similar in every respect to those that exist in New York and other large cities.

Port Ewen still has a telegraph station at the West Shore station, a mile away, where those who object to the telephoning of their messages may file them. The complaint was brought by Charles W. Card, formerly the Western Union operator in Port Ewen, and other residents, but while they insisted on the liability of mistakes in telephonic transmission of messages they failed to adduce any actual instances. The telegrams are now written out and filed at the Western Union branch in the village and telephoned to the Kingston office.

New Mexico

A number of informal complaints have been filed with the State Corporation Commission, complaining of telephone conditions within the county of San Juan. Some of these complaints had to do with service at Aztec, others at Farmington, and still others related to the question of free toll service between the Aztec and Farmington telephone conditions within the county of San Juan. Some ment and service at both of these exchanges. Attempts were made by the commission to adjust these various complaints, as provided by statute, through mediation. This having failed, the commission consolidated all of the complaints and ordered a public hearing on the matters complained of, to be held at the court house at Aztec. Hearing was held with an adjourned hearing at Farmington, New Mexico.

The specific allegations of complainants investigated at this hearing were principally that the Mountain States Telephone Company unlawfully and unjustly discriminates against certain of its subscribers in New Mexico, in that it furnishes to certain of its subscribers what is known as free district service, including both the Aztec and Farmington exchanges, and to others of its subscribers limits the free service to either the Aztec exchange or the Farmington exchange, as the case may be, and denies to such subscribers the so-called free district service at both the Farmington and Aztec exchanges. Also that the company makes an excessive charge for toll service between the towns of Aztec and Farmington. Further that the company has received and does now make an excessive charge for exchange service to certain Mutual telephone lines and the subscribers connecting with the exchanges of Aztec and Farmington, which mutual lines are owned and maintained by residents living adjacent to such lines which connect with these exchanges at the town limits of Aztec and Farmington. Also that the company has unlawfully and arbitrarily cancelled numerous contracts with its subscribers, who, under contracts, were en-

titled to free district service, including both the Farmington and Aztec exchanges, and, in fact, the entire settlement of San Juan county, and has compelled Mutual telephone lines and the subscribers to pay excessive rates for the privilege of exchange service at both Aztec and Farmington.

Equipment and instruments of the Mountain States Telephone and Telegraph Company furnished subscribers was declared out of date and obsolete.

From the testimony it appeared that the Mountain States Telephone and Telegraph Company, from its operations in San Juan county, has never made a profit. The general financial statement of the company, covering New Mexico, was introduced in evidence, so that the commission was in a position to determine that the revenues derived from San Juan county business are not now and never have been sufficient to give the defendant company a reasonable return upon the capital invested in that county at any time since the construction of the toll lines and the two exchanges.

From an examination of the tariffs on file with the commission and the further examination of the testimony introduced, it appeared that the existing rates for the business and residence telephones in San Juan county are not in excess of the rates charged for similar service at various other points within the State of New Mexico, but as a whole, they are on an average less than the general charge made in other communities.

As to toll service between Aztec and Farmington, the rates charged are less than the rates for similar service at other points within the State of New Mexico, in most instances. Such being the facts, the commission stated that the present rates in San Juan county are not excessive. The commission, therefore, recommended to the Mountain State Telephone and Telegraph Company that it eliminate all discriminatory charges to patrons of its lines in the San Juan county district to the extent of eliminating free service between the toll exchanges of Farmington and Aztec. It further recommended that the service charged on mutual lines be reduced from 75 cents to 50 cents per month per station; and that the toll charge on toll lines between Aztec and Farmington, and vice versa, be reduced to ten cents per call for number call, and 15 cents per call for party call, instead of ten cents per call for number call and twenty cents for party call.

The commission also finds from the evidence that the telephone lines should not be burdened with social calls to the exclusion of commercial business. That all discrimination in the matter of the same class of service should be eliminated regardless of previous contract.

As to the character of the equipment in the communities of Aztec and Farmington the evidence indicated that the revenues received in San Juan county are not remunerative, and the commission holds that it would be unjust to require the defendant telephone company to remodel its plant and install a common battery service and phone stations.

The commission finds further that present rates are not excessive, but that these rates should be supplemented by the installation of an eight-party residence service within the exchange limits at a monthly rental of not to exceed $1.50 per month.

It has been suggested to the commission that the defendant telephone company should reduce the toll service charge between Aztec and Farmington to ten cents for particular party call and five cents for two-number service. From the evidence offered the commission refuses to order such reduction, but in event the company should so desire to make such change in its schedule for such service between these two stations, because of special conditions existing in the County of San Juan, the commission will consider this question when it is properly presented before the commission.

In view of the testimony and the foregoing statement of facts, it was ordered that the petition of the complainants be denied.

Illinois

On Wednesday, October 13, 1915, a hearing was held at the office of the State Public Utilities Commission of Illinois, 714 Insurance Exchange building, Chicago, in the matter of the application of the DeKalb County Telephone Company for authority to charge higher rates.

The commission's engineering department was called on the witness stand and O. M. Burgess, telephone expert, testified that the amounts included in the intangible items of the DeKalb County Telephone Company's report prepared by McMeen & Miller, engineers, were questionable and apparently too high.

A. H. Krom, assistant engineer, who was in responsible charge of the field check in behalf of the commission brought out the points that the report of McMeen & Miller, engineers, was substantially correct as to the inventory of the physical property and that the unit costs as applied were very fair, but that the present condition which had been applied to the reproduction cost to determine the present value was too high.

The cities of DeKalb and Sycamore have secured the services of Garrison Babcock as the expert to defend their case.

The 240 telephones of the Henry County Mutual Telephone Company that have been operated through the Kewanee Home Telephone Company central for a number of years will be operated through some other in the future.

Unless this is done the Henry County Company will be forced to pay a fine of $1,000 per day, according to an ultimatum sent to the secretary of the company from the state utilities commission.

This is the result of a fight which has been in progress between the telephone company and the utilities commission since July 1, 1914. At that time the commission handed down a ruling which affected the company. Up to the present time the matter has been in dispute but the company has now been notified that the commission cannot alter its ruling. Rather than pay the thousand-dollar-a-day fine it is considered probable that a change in switching central will be made.

In brief, the ruling of the utilities commission which was passed July 1, 1914, provided that no mutual telephone company operated as a public institution could be switched through a central operated by a private company for profit unless certain conditions were complied with. The Henry County Mutual Company contended that it did not come under the ruling as it was not a public institution. That it was operated for the convenience of the stockholders and not for profit, was the basis of the claim. The commission ruled against the contentions of the Henry county company and ordered them to take immediate action.

Kempster B. Miller, representing the DeKalb County Telephone Company of Sycamore, Ill., testified before Commissioner Richard Yates of the Illinois State Utilities Commission in an effort to justify the proposed increases in telephone rates asked by the company.

Washington

That government ownership of telephones will come unless regulation speedily remedies the wide divergence of telephone rates that prevails in many parts of the country, is the opinion of Charles A. Reynolds, chairman of the Washington State Public Service Commission, who as chairman of the committee on telephones and telegraphs of the National Association of Railroad Commissioners, has prepared the report for the coming convention to be held in San Francisco. The report has met the approval of the majority of the committee.

The report includes a symposium of letters from federal officials, governors of states and men holding chairs of political science and government in universities. These reply to the question: "Should the government own all electrical means of communication, or continue its policy of dealing with these systems of communication as a regulated monopoly?"

Oklahoma

The Skiatook Telephone Company was cited by the State Commission to appear before the commission on October 12 and answer a complaint filed by A. W. Lucas. The complaint charges the company with giving inadequate service to its patrons in Skiatook.

Minnesota

Patrons of the O. K. Rural Telephone Company, Marshall, cannot be permitted the use of the lines of the Grygla Telephone Company. The Minnesota State Railroad and Warehouse Commission issued this order, following a petition by subscribers who sought to have the Grygla continue the service.

The commission rules that the subscribers of the O. K. line if they want to telephone to Grygla, seventeen miles distant, must erect their own lines to that place.

Oregon

As a result of a general investigation by the Public Service Commission of Oregon into the rates, charges and regulations of the Pacific Telephone & Telegraph Company, the following rules and regulations have been prescribed, and become effective November 1, 1915:

Rule 1. The telephone utility may, under uniform rules and regulations, require payment in advance of rendering unmetered, unmeasured or flat rate exchange service for a period not to exceed that for which bills are regularly rendered as specified in its rate schedules, but may not demand other guarantees to secure payment for service to be rendered in the future.

Rule 2. At the option of the telephone utility, it may discontinue an unmetered or unmeasured or flat rate exchange service for failure to pay for such service in the manner provided by the existing schedules of the utility and by these rules, or for other incidental telephone charges due from the customer because of the installation of such service, covered by the lawful schedules of the utility, but not until written notice has been given to the customer of intention so to do.

Rule 3. The telephone utility may, under uniform rules and regulations, require an applicant for metered or measured exchange service to establish his credit before service is delivered, unless a prepayment device makes such procedure unnecessary. The applicant's credit will be deemed established if he (1) owns the premises to be served; or (2) makes a cash deposit; or (3) furnishes a guarantor for the payment of his bills satisfactory to the telephone utility; or (4) has paid all his bills to the telephone utility promptly during the twelve months prior to the effective date of the order herein.

Rule 4. If an applicant for metered or measured exchange service makes a cash deposit to insure the payment for exchange service to be furnished him, the amount of the deposit shall be such as may be specified in the utilities rules, but in no event in excess of twice the average periodic bill of customers in his schedule; provided, that the deposit for domestic or residence metered or measured exchange service shall not exceed $2.50, and that the deposit for business or commercial metered or measured exchange service shall not exceed $5.00.

Rule 5. If a customer for metered exchange service has initially established his credit in the manner provided in these rules, but later fails to pay his bills, the telephone utility may demand as a guarantee for the payment of future bills a cash deposit.

Rule 6. If a customer for metered exchange service has made a cash deposit, but afterwards fails to pay a bill for metered exchange service, the utility may apply the deposit in so far as necessary to liquidate the bill and may require that the deposit be restored to its original amount.

Rule 7. The telephone utility may not discontinue a metered exchange service for failure to make a deposit, until written notice has been given to the customer of intention so to do.

Rule 8. The telephone utility may not discontinue metered or measured exchange service by reason of non-payment of other bills than for the particular service for the current month and service bills immediately prior thereto.

Rule 9. After a cash deposit to guarantee payment for metered or measured exchange service has stood unimpaired for twelve months it shall be returned to the depositor. Upon closing any account the balance of any deposit remaining after the closing bill for service has been settled shall be returned promptly to the depositor.

Rule 10. The telephone utility may, under uniform rules and regulations, permit the sending of telegrams and long distance or interexchange messages on credit by or to all of its patrons, without the demanding of any deposit to secure payment of the charges therefor; but in event the customer responsible for such charges fails to pay the same within fifteen days from the date of billing, the telephone utility may require the customer to make a cash deposit equivalent to the defaulting customer's average two months' bill for such toll or interexchange service.

Rule 11. Interest at the rate of six per cent per annum shall be paid by the telephone utility on all deposits held by it to secure the payment of bills for metered or measured exchange service; provided, the deposit has not been impaired during the time it has been held by the telephone utility, and provided no interest need be paid if the service is discontinued within less than twelve months from the date of first taking service.

Rule 12. The telephone utility may not require an applicant for any exchange service within incorporated territory to sign a contract for service as a condition precedent to the rendering of such service. The utility may, however, require that a reasonable written application for service be made, and if the applicant claims to establish his credit by the ownership of the premises, he may be required to state such fact in his application.

Rule 13. The term "service connection" as used herein includes the necessary wires, meters, instruments and appurtenances for adequate telephonic service of the customer's premises. The telephone utility shall install at its own expense a proper service connection to the point of installation upon the customer's premises agreed upon. Subject to review by the commission, the telephone utility may refuse to make a service connection if it believes that the service applied for will not be used in the reasonably immediate future.

Rule 14. Under reasonable rules and regulations to be prepared in the first instance by the utility, and to be approved by the commission, the telephone utility may elect and provide that the reasonable cost of disconnecting and reconnecting an exchange service connection, not exceeding $2.50 per customer's station, may be (1) charged directly to the resuming customer in event be applies for the same or a lower class of service at the same or other premises within six months after such disconnection, or (2) such cost may be merged in the general operating expenses. The so-called cancellation charge of the telephone utility is hereby abolished.

Rule 15. When the telephone utility operates under a general franchise authorizing the occupancy of all of the streets of a city or town, it shall, at its own expense, make such street extensions as may be necessary to serve all applicants for exchange service within such municipality.

Rule 16. The telephone utility shall make such reasonable extensions at its own expense in unincorporated territory as it can agree upon with the applicant for exchange service.

Rule 17. In any case in which the construction of an extension at the utility's sole expense as provided in Rule 15 or Rule 16, will in its opinion work an undue hardship upon the utility or its existing customers, the matter may be submitted formally to the commission for determination, unless satisfactorily adjusted by an informal application, and equitable adjustment will be made by the commission.

Missouri

Representatives of the Southwestern Telegraph and Telephone (Bell) Company have submitted to the Missouri Public Service Commission a schedule of rates for business service in St. Louis. The schedule has not been filed, but is held, pending decision by the commission on a proposition of the company to make the schedule a test for a year. The Bell Company is submitting testimony to show that the schedule proposed is in accordance with the real value and earning capacity of the St. Louis plant.

The proposed new schedule was prepared in accordance with a ruling of the commission several months ago, on the application of the company for an increase in the rates on business telephones in St. Louis. The commission held that, while the increase could not be granted, the existing rates were too low and authorized the company to file a new schedule.

Under the rates denied it was estimated that the company would increase its gross earnings on St. Louis business about $158,000 a year.

Under the schedule the company is asking to test for a year the rate for a single-line, unlimited business telephone, is fixed at $108 a year in place of $120 a year in the application for the increase denied. The present charge for this service is $78 a year.

Under the schedule for $45 per year there is a limited service of 840 calls, this being increased from 600. A new service is proposed calling for $60 per year and limited to 1,200 calls. Provision is made for a $65 service limited to 1,500 calls. A $78-a-year service limited to 1,920 calls is proposed.

The two-party line service at $39 per year is increased in the number of calls from 600 to 720.

Residential service is not affected in any way by the proposed new schedule.

The rate fixed by the company on the single-line unlimited service at $108 per year is slightly in excess of the charge, members of the commission believe, would be proper.

The position of the company in the matter is that the commission, in rejecting its application for an increased schedule erred and that there was error on the part of the commission in fixing the valuation of the plant upon which to base its earning capacity.

It was urged by General Solicitor S. H. Harris, J. W. Gleed and Special Counsel Frederick W. Lehmann on behalf of the company that a test of the schedule prepared would show that the original increase asked is just.

General Manager W. J. Hiss and Edward F. Carter, commercial engineer for the company, testified that the schedule would show conclusively after a test of a year that the original contention of the company as to the increase was correct.

The question as to whether the test will be allowed will likely not be determined by the Commission for a day or two.

Maryland

Claiming the right to earn over a half million dollars more than the present rates net it, the Chesapeake and Potomac Telephone Company has filed its brief with the Public Service Commission of Maryland.

The case is one in which the commission has been trying to fix a valuation for all the telephone company's property in Maryland. It originated in December, 1913, on complaint of the Telephone Subscribers' Protective Association, which claimed that the present rates were giving an excessive income on the amount of capital represented by the telephone business in the state.

The telephone company sets forth the contention that all of the evidence produced at the hearings indicates a valuation for the corporation's property as follows:

Tangible property on hand September, 1913	$12,812,119.00
Cost of establishing business	396,179.00
New additions up to June, 1914	750,078.00
Easements	1,210,872.00
Total valuation	$15,169,248.00
Total gross revenue for the year	$ 3,348,615.03
Annual expenses	2,667,577.19
Net income	$ 681,037.84

This net return is claimed to be less than 5 per cent on the investment, and various authorities are quoted to show that telephone companies are entitled to a profit of 8 per cent.

If this latter rate of profit were granted on the valuation claimed it would call for an increased return of $532,502.

It is therefore claimed that instead of the present telephone rates giving an excess profit on the capital invested they are giving only a trifle over half what the company is entitled to.

National Association of Commissioners Discuss

Government ownership of telephones and telegraphs will come unless regulation speedily remedies the wide divergence of rates that prevails in many parts of the country, in the opinion of Charles A. Reynolds, chairman of the Washington State Public Service Commission, who, as chairman of the committee on telephones and telegraphs of the National Association of Railroad Commissions, has prepared a lengthy report for the convention of the national commission at San Francisco.

Refuses to Authorize Washington Merger

Everett, Wash., is wondering what the status is regarding the proposal to merge services of the Sunset and independent telephone concerns. Understanding that the state of Washington had no power to grant or compel a merger, either by purchase or otherwise, and that the federal government was the proper authority to reach, the city is asking that the desired amalgamation be sanctioned.

The department of justice states it has no power to authorize or give its consent to a proposed consolidation of telephone properties any more than it has the power to pass in advance upon the legality of consolidation of railroads or of producing and trading corporations, or any other business arrangements.

Plan to Unite Small Companies

The uniting of all the telephone companies of Osceola county, Mich., under one organization is the latest plan. The name of the new organization, if formed, will be the Osceola County Telephone Company and will include many small companies. The need for one strong company to control the telephone business in the county has been felt for some time and the majority of the citizens are in favor of the plan.

Through the Big Kellogg Factory

Wonderful Equipment at the Service of the Independent Operator

SUCH are the wonders of time that man has but to open his eyes to witness a procession of events, achievements and feats of which he could not even dream yesterday. And when one stops to consider the billions of yesterdays—each with its quota of achievements, each with its audience of millions who are either passively looking on or doing an individual share toward the harnessing of thought which will culminate in an achievement—he cannot but wonder what tomorrow will bring. That today is no different from yesterday, in so far as the striving, groping and achieving of master intelligence is concerned, is obvious, as everything since the dawn of history points to this aggressive ambition through striking results—artistic, structural and mechanical.

"In 1897—A Small Plant at Highland Park, Illinois."

Small wonder then that with each tomorrow the possibilities grow and finally unfold into a flower of achievement which will bloom on forever improved by evolution in order that its hue may blend with the general color scheme as today swiftly makes way for tomorrow.

As we enjoy the results of an achievement, it is interesting to hark back to the yesterday of its inception and watch it gradually round out into its present perfection.

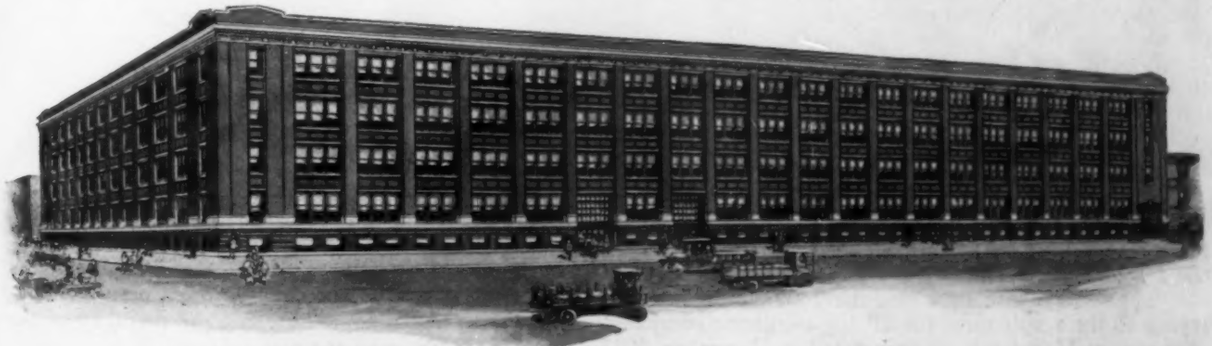
So, in 1897, we see the incorporation of the Kellogg Switchboard & Supply Company, a small plant in operation at Highland Park, Illinois. Here, in a one-time school building, Milo G. Kellogg, a genius and a pioneer, threw down the gauntlet in the face of monopoly and unfurled the banner of independence while his co-workers, able men all, broadened under his generalship.

The new Kinloch Telephone Company at St. Louis had in a year grown to the point where its requirements demanded a larger and more adequate switchboard and a careful scanning of the manufacturing field prompted the belief that Milo G. Kellogg was the man in whose hands this important task should be entrusted.

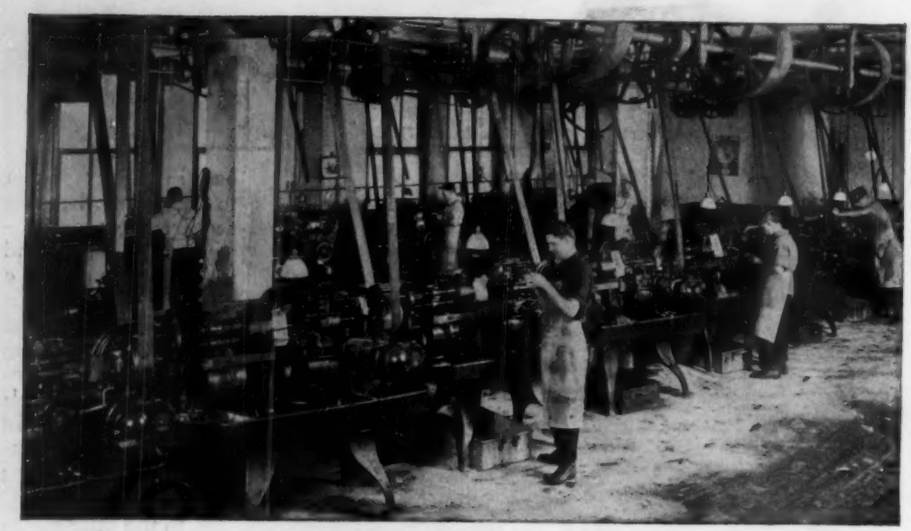
In the little Highland Park factory was conceived the gigantic St. Louis switchboard. There it was built, completely and successfully, as its immediate installation and long years of service have proven to the world.

The building of that switchboard, the biggest in the world, was, indeed, a master stroke—a daring undertaking on the part of the young manufacturing institution and a step as wise as it was daring on the part of the Kinloch Telephone Company. Indeed, a splendid tribute to the genius of the manufacturer and the judgment displayed by Independent companies, is the fact that after years of constant use, many of the original Kellogg switchboards are still in service.

And then there were many other famous Kellogg exchanges, and many of these earlier installations are still in service. Notable among these first big switching plants, for the wonderful service which they gave for their time, that aroused the world to the value of Kellogg equipment, were Buffalo, N. Y.; London, England; Scranton, Pa.; Odessa, Russia; Cleveland, Ohio; Philadelphia, Pa.; Indianapolis, Ind.; Los Angeles, Cal.; Baltimore, Md.; Albany, N. Y.; Canton, Ohio; Logansport, Ind.; Columbus, Ohio; St. John, N. B., Canada; Hamilton, Ohio; Jackson, Mich.; Johnstown, Pa.; the big Minneapolis toll board; Pasadena, Cal.; Raleigh, N. C.; Redlands, Cal.; Santa Barbara, Cal.; Vincennes, Ind., and Webster City, Ia.



Situated On the Corner of West Adams and Aberdeen Streets, Chicago, Is An Immense New Four-Story Building.



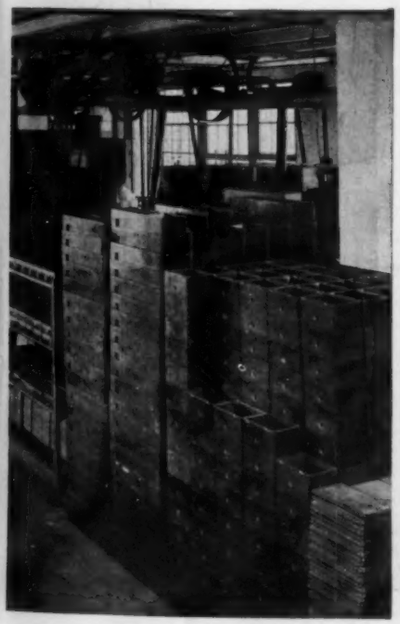
Sections of Automatic Screw Machine Department in the Kellogg Plant. Here Are Produced Special Parts Used in Telephone Equipment

Views in the Tool Room, Where All the Various Tools Required for Manufacturing Telephone Equipment Are Mad

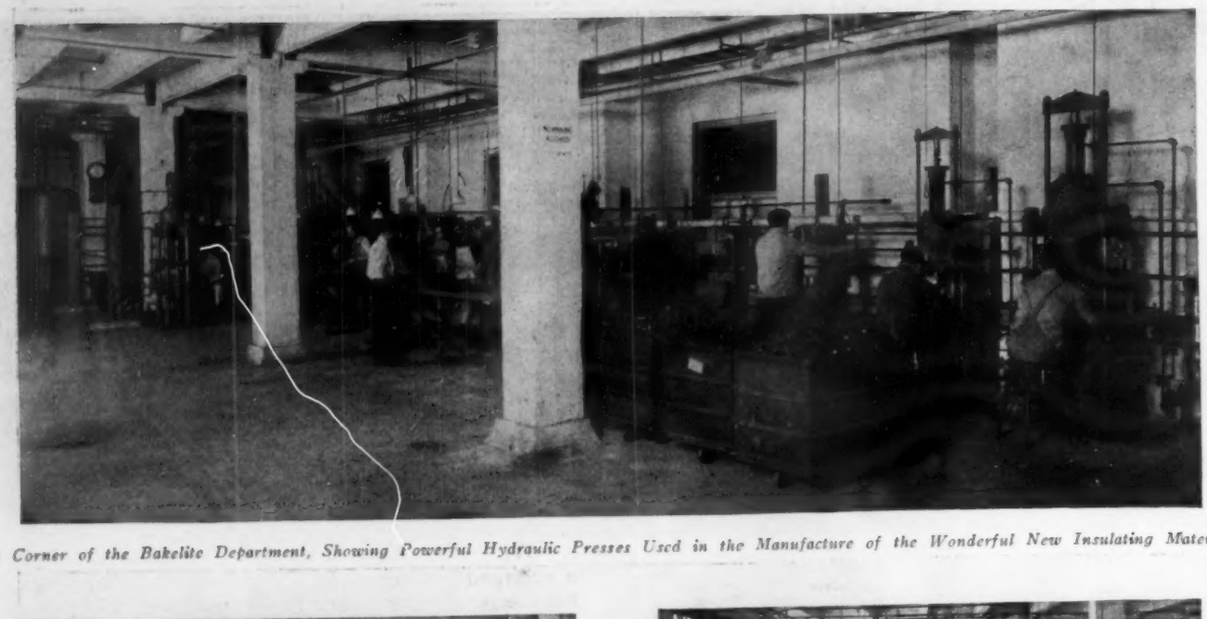
The Telephone Assembly Department, Where the Parts of the Desk Stands and Subscribers' Instruments Are Inspected and Assembled

Machines Automatically Perform From One to Six Operations in Shaping, Threading and Cutting in the Turning Out of a Perfect Product.

Bench Lathes Are Shown on the Left, a Battery of Milling Machines in the Center, and a Group of Shapers on the Right.



A View of the Stockroom and Telephone Cabinet Shop on the Right, the Department Where Telephone Relays Are Assembled.



A Corner of the Bakelite Department, Showing Powerful Hydraulic Presses Used in the Manufacture of the Wonderful New Insulating Material.

All Telephones Are Inspected After Being Assembled.

A Section of the Switchboard Key Department.

In the Coil Winding Department Are Wound the Various Kinds of Coils Required for Telephone Apparatus.

Some of more recent type and new and interesting Kellogg switchboards are found in the equipment furnished for Santos, Brazil; Wusieh, China; Sao Paulo, Brazil ; Janesville, Wis.; Ashland, Ohio; Ft. Dodge, Ia.; Hoopeston, Ill., and Portsmouth, Ohio.

Of the famous Kellogg instantaneous recall boards, there are Painesville, Ohio; Troy, Ohio; Sewickley, Pa.; Bellevue, Pa.; Oakmont, Pa.; Canonsburg, Pa.; St. Petersburg, Fla.; Greenfield, Ind.; Tipton, Ind.; Chippewa Falls, Wis.; Alpena, Mich.; Portage, Wis.; Hillsboro, Ohio; Rice Lake, Wis.; Tipton, Ind.; Moultrie, Ga.; Warren, Ohio, and Fredonia, Kans.

Many of the older boards in service have been rehabilitated with the Kellogg instantaneous features. Among these exchanges may be mentioned Moxham, Pa.; Johnstown, Pa.; Cleveland, Ohio—Central exchange, Union Exchange and Crest exchange; La Crosse, Wis.; St. John, N. B.—Main exchange and West exchange; Red Wing, Minn.; Pomona, Cal., and High Point, N. C.

A View of the Electroplating Department of the Kellogg Plant.

While the exchange telephony of today stands as great daily proof of Kellogg excellence, the thousands of plants of the most modern Kellogg magneto and common battery equipment throughout the country are the certain evidence of Kellogg standard.

In a brief time the Kellogg Company left Highland Park for Chicago, necessity having demanded more commodious quarters, closer touch with skilled labor and contiguity with more ample shipping facilities.

The switchboard for the Kinloch Telephone Company had been built and installed bearing the now world-famous Kellogg nameplate; and the pioneer had blazed the trail which opened the way to Independence. Nor was Independence the only aim of this small but aggressive fighting force, for it constantly looked to the betterment of its product that it might, from a standpoint of scientific construction, stability and efficiency, forever stand in a class by itself. The wisdom of this forethought and adherence to all for which it stood during the succeeding years has been amply proven by the success of the company.

Again we see the constantly increasing business compelling a change of quarters, when, in 1902, the eight-story building at the corner of Congress and Green streets became the home of the Kellogg Switchboard & Supply Company.

When the company moved to Green street, Chicago, to enlarged quarters and better manufacturing facilities, there was given to the telephone world the first lamp signal common battery switchboard in the Independent field; also the self-restoring drop and jack of the shutter type.

At this time the Kellogg Company placed on the market the first harmonic selective ringing telephone. This equipment, like the Kellogg drop and jack, is known the world over. The use of this harmonic system, with its vast saving in maintenance and the splendid service it made possible, has contributed as much to the success of the Independent movement as any other advance in the field.

In its early days the Kellogg Company manufactured only common battery apparatus; but its first magneto switchboard, which, by the way, is still working today, represents a type that was the talk of the telephone world. These boards have held their place as the leaders in giving the finest magneto telephone service and the thousand in arduous service under all circumstances prove the value of the Kellogg idea, "Kellogg equipment is built up to a standard and not down to a price."

Every improvement in Kellogg switchboards—the complete Kellogg line from refinements of minutest parts to ringing equipment—has been brought about by untiring energy and the foremost idea has ever been to produce a telephone equipment that will best serve the interests of the Independent telephone operator.

Corner of Shop Office, Showing Modern Office Systems.

From a Kellogg wall telephone in the hut of the mountaineer, to the malleable iron mine set operating thousands of feet below the earth's surface, special and particular types of telephones have been built and standardized for use in out-of-the-ordinary service conditions.

Kellogg railway equipment is operating today on many of the longest and best-known lines and giving service on a par with the Kellogg ideal.

The individual parts of all equipment, such as lamps, condensers, insulating material, and the thousand things that go to make a standard finished article, are built at the Kellogg plant with

A View of the Milling Machine, Where Parts of Telephone Apparatus Are Milled or Cut to the Required Dimensions.

Some of the Lathes and Drill Presses for Miscellaneous Work. Generator Manufacturing Department at the Right.

Generator Armatures, Gears and Frames Are Carefully Assembled and Ad justed, Making a Complete Generator Assembly.

unsurpassed facilities fof their correct production. No one can visit the Kellogg lamp department, for instance, or the condenser department, without being impressed with the thoroughness and the care put forward in the production of this satisfactory apparatus.

On a twelve-acre tract, the immense woodworking

Accuracy Is Essential in the Tool Room and Die Department. A View in the Coil and Condenser Department.

plant is located at Cassopolis, Michigan, where construction efficiency is patterned after the main plant. Here are eight well-lighted, roomy buildings with the most complete machinery. In addition to these, there are two warehouses and a complete dry kiln. In fact, there is in every way a modern woodworking establishment built

Automatic Machines Are Indispensable Parts of the Modern Factories' Equipment. Kellogg Automatic Machine Equipment for This Work Is Unexcelled.

with a particular idea of producing the highest grade telephone boxes and switchboard cabinets.

Today there are over 9,000 switchboards in service bearing the Kellogg nameplate and over a million and three-quarters of one type transmitters.

Not only has this equipment won an enviable name and reputation at home, but it has been adopted as standard by several European governments. Well may it be said today that Kellogg apparatus is in service on the four quarters of the earth.

Many of the most important and attractive improvements in the telephone field have been originated by this company, which has resulted in constant imitations by its competitors; and nowhere is this more effectively mentioned, as an example, than in the Kellogg instantaneous recall board.

The wonderful combination of advantages in this switchboard, as combined and put on the market only by the Kellogg Company, has not only been imitated far and near, but copying companies have actually claimed this invention as original with them, imitating names as well as apparatus.

In the last eleven years much telephone history has been written with monopoly on one side and the Independent manufacturer on the other. The business of the Kellogg Switchboard & Supply Company increased by giant strides, until today it stands the largest Independent telephone manufacturing company in the world.

A View in the Coil and Condenser Department.

What more fitting, then, than a permanent home for this vast and growing institution—a home, itself susceptible to structural growth when occasion demands, to stand forth as a monument to a wonderful achievement and a wonderful man?

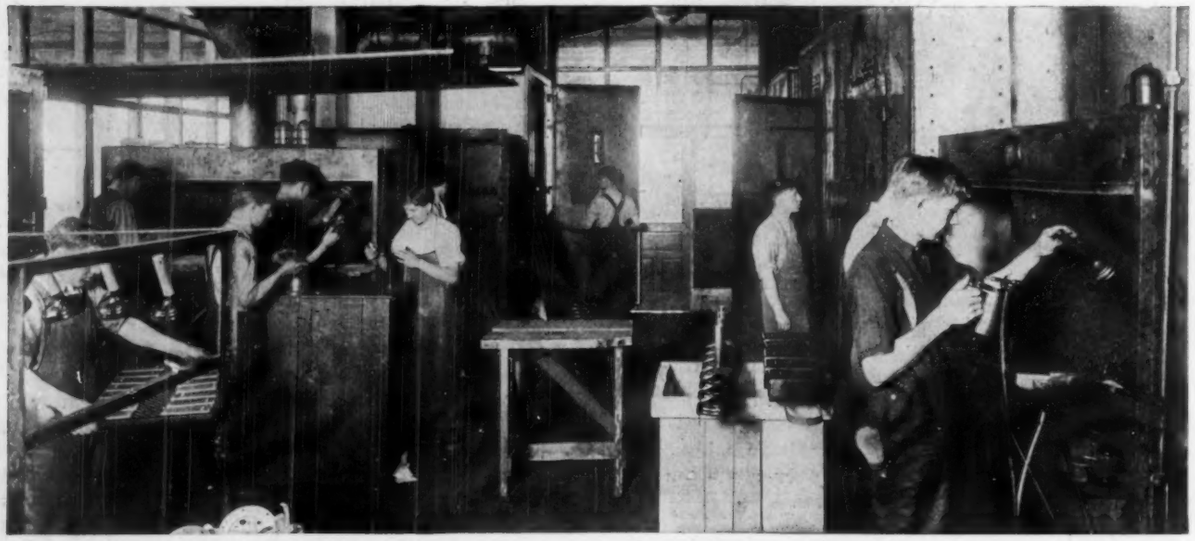
Situated on the corner of West Adams and Aberdeen streets, Chicago, is the immense new four-story and ground floor building with a frontage of 396 feet on the former street, and 238 feet on the latter, one-half of a city square. Here, with a floor area of 404,888 square feet—over nine acres of floor space—is the new home of the company.

An unusual feature is the division of this great floor area into separate buildings with interior light courts which insure a maximum daylight from every angle. This superior illumination, coupled with the best mechanical equipment that money can buy and the highest grade of skilled workmen, can only make for perfection in product.

Although the company has occupied the new building but a few months, it has already become a show place for visiting telephone men in Chicago. They spend many profitable hours in its many departments, studying Kellogg switchboards, telephones and telephone apparatus in the making. These visitors are welcome to any courtesy which the Kellogg organization can confer upon them, since in a large measure it owes to them and their

A Section of the Department in Which the Various Kinds of Telephone Switchboard Keys Are Assembled.

Switchboard Cable and Wire Department. Wire Is Wound on Standard Spools, Which Are Then Weighed and Marked.



Kellogg Enamel Department, Where the Wonderful Insulated Covering of K ellogg Telephone Apparatus Is Prepared and Applied.

predecessors a success unparalleled in the world of Independent telephony.

A visitor, on entering this immense and magnificent plant, parts with the commonplace. He does not see a "factory" in the usual meaning of the term, where there is grime and dirt and dust and shadows and dripping oil.

After Being Plated, the Pieces Are Polished.

He enters a manufacturer's fairyland of huge, white-painted rooms and high ceilings, where, from process to process, and from department to department, amid the whirr of a thousand motors and the thunder of mighty presses take shape before him gradually, yet with the wondrous speed made possible by twentieth century methods, the Kellogg telephone and the Kellogg switchboard. He sees them in the rough material, shaped and finished, packed and shipped.

Here, indeed, is efficiency in the making! Even present-day commonplaces of the manufacturer are seen

A View of the Switchboard Assembly Department.

in a new light in this place. For instance, in the plating department, the visitor sees completeness of equipment and skill in the handling with freedom from the disagreeable features ordinarily accompanying plating department operations. He sees telephone gongs really nickel-plated —a plating put on to stay, heavy enough to last through the fifteen years of profitable service as exemplified in the earliest Kellogg sets still operating.

He sees the wonders of the switchboard lamp rooms where the big mercury pumps incase the tiny delicate filaments in their vacuum houses of glass destined to light at the command of subscriber and operator for many years.

He sees the glowing furnaces where parts are annealed and where an early glimpse of Kellogg generator magnet bars—white hot—is obtained.

The newer Kellogg Bakelite sections fascinate him. There a handful of powder made of fibre dust and two wondrous chemicals, poured into polished steel dies and in the grasp of a hot hydraulic press, are turned out in an eye-wink almost, finished telephone receivers—a twentieth century miracle, indeed. Here are made not only Kellogg Bakelite receiver shells, but Kellogg Bakelite transmitter mouthpieces and head receiver shells. This marvelous material of immense strength, unbreakable in ordinary service, unwarpable, of fast color, with permanent polish, odorless, very light, is, in fact, the ideal insulating material.

In This Department Multiple and Answering Jacks Are Assembled.

With little deviation from the basic principle of the original electrical talking device, the appointments of the telephone today indicate the most careful study; a condition especially marked in the construction of Kellogg telephones, switchboards and telephone apparatus.

For years this company was confronted by a problem of how to construct an unbreakable transmitter-mouthpiece and receiver shell. Hard rubber had primarily been selected as the only suitable material, it not alone being impervious to moisture but a non-conductor of electricity. However, its drawbacks were serious, in that its liability to breakage and damage added materially to the overhead expense of the telephone exchange. The first step of the Kellogg company toward relieving this condition was in the exploitation of its steel-reinforced shell and mouthpiece. This departure obviated the old trouble to a great extent, thus reducing the expense of upkeep. Nevertheless, the visible material was still hard rubber and the manufacturer of the article, despite highest praise and unqualified satisfaction on the part of the user, was not satisfied.

Then came the marvelous discovery of Bakelite by Dr. L. H. Baekeland, after a quarter of a century of research in the field of pure and applied chemistry. Bakelite is a substance which, in its different forms, offers the advantages of hard rubber, Japanese lacquer and celluloid, having unlimited commercial uses. However, the construc-

tion of the new Kellogg receiver shell and mouthpiece has only to do with Bakelite in its final stage; when it becomes as hard as flint and practically indestructible. It is infusible and can resist a temperature of 572° F. (300° C). It is insoluble in all solvents and can withstand strong chemicals, oil, hot water and steam. It does

View of Engineering and Specification Department.

not emanate sulphur like hard rubber, and when subjected to a flame does not suddenly catch fire or melt like rubber, sut simply chars and finally at a temperature of melting glass, it carbonizes.

It is quite remarkable that in the formation of Bakelite two strong smelling liquid substances (carbolic acid and formaldehyde) should under certain well defined conditions react chemically upon each other and solidify to a substance entirely devoid of odor or taste and quite unlike any of its components.

The Kellogg company, quick to recognize the merit of Dr. Baekeland's discovery, installed special machinery for making the composition under high pressure and after a long series of experiments wherein the product was subjected to every possible test, the new Kellogg-Bakelite specialties were pronounced perfect. The single

Packing Department.—Here All Apparatus Is Inspected and Packed by Experienced Men.

operation gives the receiver shell complete, light in weight, artistic in design and of a permanent glossy black which no amount of handling will rob of its luster. A shell calculated to withstand severest use and abuse and at once relieve the telephone company of that hitherto unavoidable expense entailed through breakage is the result of this process.

The great screw machine departments where so many parts of telephone and switchboard apparatus are produced automatically, and with seemingly almost human intelligence, are revelations to the mind of the layman.

From the automatics and well-ordered and splendidly arranged stockrooms, the visitor is taken through the wonderful enameling rooms, the cord department, the

Powerful Punch Presses Stamp Out Various Kinds of Pieces.

winding room and a score of other activities of equal interest; then to the engineering department where are shaped the practical ideas of practical telephone men, the drafting room, the experimental laboratories and the switchboard assembling sections. These latter are on the first floor, as are also the executive offices, which, be it said, are not equipped with costly rugs, mahogany furniture, or gold-framed pictures. They are just ordinary, bright, sunny, plain business offices.

The auditing and order departments, the sales and advertising departments, and, finally, the big display room, where the Independent telephone manager can see every type of Kellogg apparatus exactly as he saw it in the factory and exactly as he can see it in thousands of installations throughout the country, are next in order. Here is installed a magneto wall switchboard suitable for the rural switching station. On the other side of the room is the handsome common battery multiple section —the instantaneous recall switchboard, which is proving

The Shipping Room.—Always a Busy Place.

its great worth and epoch-making advantages already in a score of exchanges throughout the country. On exhibition also are the various sizes of Kellogg magneto boards and Kellogg p. b. x. equipment, as well as special sets, including telephones adapted for railway work.

Upon leaving, the visitor is impressed again with the value of the Kellogg slogan—its adaptability to this plant. Here, indeed, is a factory wherein "Use Is the Test."

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

IN THE common battery telephone system, the subscriber calls the exchange by removing his receiver, which action grounds the exchange battery (24 volts) by way of the calling relay *TAR*, the contacts of the cut-off relay *TTR*, and also the microphone of the subscriber telephone, and then operates the calling relay. (Fig. 1.) The call lamp *TAL* will be lighted as long as the calling relay is in action, and is extinguished when by the use of the *A. S.* or the *V. S.* plug the cut-off relay has been operated by way of the *c*-branch, thereby interrupting the current circuit, or else, when the subscriber hangs up his receiver again. In doing this, the current circuit is interrupted and the armature of the calling relay returns to the rest position.

The lamps may light up, however, without the action of the subscriber, by having both branches of the telephone line come in contact with each other, or by having the *b*-branch of the line be shunted or short circuited, or else by having the subscriber lift off his receiver and forget to hang it up again. In either case the call lamps will be lighted an indefinite length of time, and aside from the waste of current, are subject to the following disadvantages: The attention of the operator is distracted by the lighted call lamp and she cannot devote all attention to her work, which would be the case if all lamps were dark. Since with a telephone system having continuous, burning lamps, the call supervisory lamps are lighted up at the same time with the call lamps and keep lighted while the latter are lighted, the supervisory lamps are useless and lose their controlling function. Moreover the supervisory operator cannot judge rightly in reference to the work of the operators, if the supervisory lamps are subject to the disturbances mentioned or to the forgetfulness of subscribers.

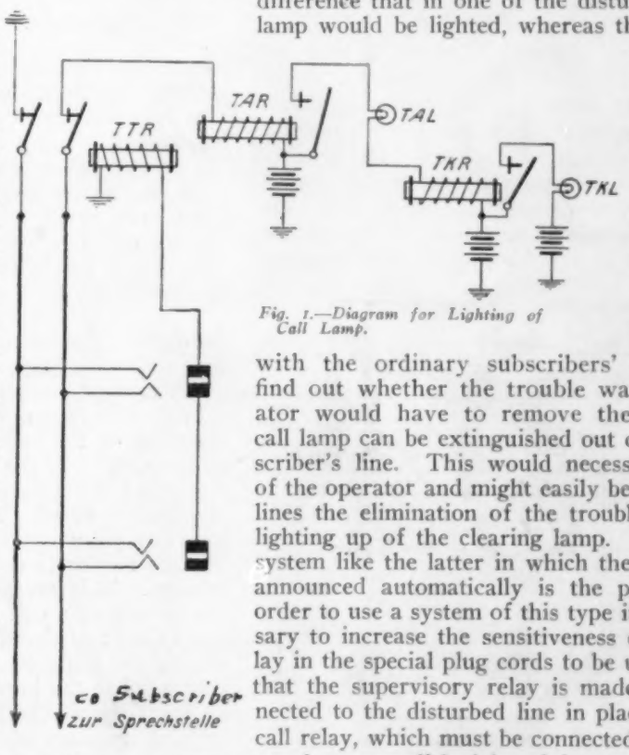


Fig. 1.—Diagram for Lighting of Call Lamp.

Various attempts have already been made to eliminate these difficulties. Small screens provided with an aperture to let the light shine through have been used to screen off the light of the lamps. But this has the disadvantage that, when the disturbance is finally removed, the aperture being small, a new call may be overlooked. To remedy all these matters, a corrective system was introduced at the Elberfeld exchange, which is equipped with the Western telephone system.

As was said before, the possibility is offered to extinguish a continuously burning lamp by placing one of the plugs belonging to the switchboard cords into the inquiry jack or else into one of the multiple jacks of the disturbed subscribers' lines. This would work the proper cut-off relay and the call relay would be disconnected, resulting in the extinguishing of the call and the supervisory lamp. If in the case of line disturbances the resistance of the *b*-branch is not too high in proportion to the sensitiveness of the supervisory relay, this relay is also operated at the same time, preventing the lighting of the clearing lamp. As the removal of the disturbance is shown by the lighting of the clearing lamp belonging to that plug, it is easy to determine when the plug *AS* can be removed and the line be given over to business. The operation of the supervisory relay depends, however, on the fact that the resistance at the place of trouble is not too high. Since the calling relay is much more sensitive than the supervisory relay, it might happen that when a plug is placed in the jack of the disturbed line, the supervisory relay is not operated with a corresponding high intermediate resistance, and therefore the clearing lamp does not light up, although the disturbance appears in the continuous burning of the call lamp. If then, for disconnecting the call lamps the usual plugs were used, there might be the difference that in one of the disturbed lines the clearing lamp would be lighted, whereas the other clearing lamp would remain dark. In the first case the fault due perhaps to some shunting or short circuiting in the *b*-branch would not be remedied, as neither the supervisory relay nor the clearing lamp would be affected by plugging the jack with the ordinary subscribers' cords. In order to find out whether the trouble was removed, the operator would have to remove the plug by which the call lamp can be extinguished out of the jack of the subscriber's line. This would necessitate special attention of the operator and might easily be overlooked. In other lines the elimination of the trouble would show by the lighting up of the clearing lamp. It is obvious that any system like the latter in which the end of the trouble is announced automatically is the preferable system. In order to use a system of this type it would only be necessary to increase the sensitiveness of the supervisory relay in the special plug cords to be used to such an extent that the supervisory relay is made to work, being connected to the disturbed line in place of the disconnected call relay, which must be connected to the *b*-branch. This can be accomplished by giving to the supervisory relay the same magnetic coil winding as the calling relay and by cutting off the translator from the telephone circuit. In addition, the supervisory relay must be connected from the *a*-branch to the *b*-branch of the line. (See Fig. 2.)

There is one little point, however, that may cause complaints by subscribers. Since through the use of the emergency plug in the *c*-branch, current is sent into the

multiple jacks, the subscriber's line will appear to be busy owing to the clicking noises heard in the receiver, when the operator tests the line for "busy" signal. Any other subscriber calling the subscriber whose line is disturbed will be told that the line is busy, which is not the case. This can be remedied, however, as Fig. 2 shows, by connecting to the *c*-branch of the plug cord the second winding of a buzzer-translator, whose primary coil is to be connected with the brushes of a signalling machine, which produces a certain definite tone. Of course, the tone of this buzzer, which shows the subscriber line to be disturbed, must be quite different from that used for other test purposes. In order to prevent the 24-volt battery from being short-circuited by way of the secondary winding of the buzzer translator (with 0.09 ohm), and also to prevent the lighting of the clearing lamps of the other plug cords, when using one of the emergency plugs, a condensor is connected within each bridge between the *c*-branch and the winding of the buzzer-translator. In addition a choke coil must be connected in each *c*-branch coming from the battery, so that the a. c. buzzer current may not be conducted through the battery to the telephone circuits of the other subscribers' cords, thus causing noises in the receivers. Of course, the choke coils need not be connected, if the translator is not grounded. Whether this system is to be used by using one of the 17 pairs of cords at each operator's place for the emergency cord system, or by installing special cords, depends on the traffic conditions. How many plugs are to be used at each switchboard also depends on the individual conditions. In general, smaller exchanges will find it sufficient, if the central position of each multiple board is provided with a specially marked pair of emergency cords, which can be used for two trouble lines at the three operators' places of each multiple board. The operator in front of whose place the special cords are, will use them in case of trouble and will also remove

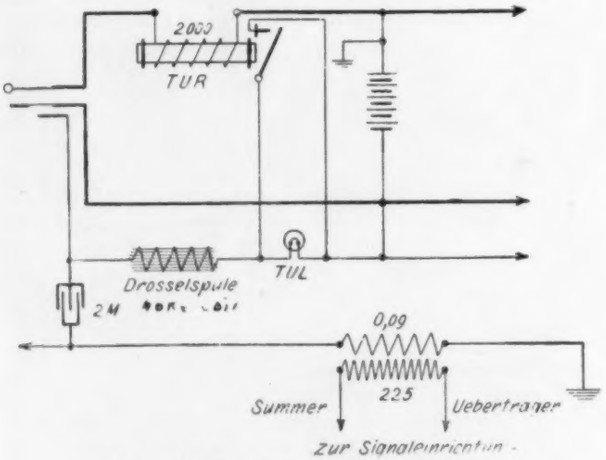


Fig. 2.—Diagram for Removal of Lamp Trouble.

them, watching specially marked lamps for that purpose. The proposed system is applicable only for exchanges whose multiple jacks consist of parallel jacks. In switchboards with double break contact jacks the lamps can be extinguished by plugging the jacks with wooden plugs or ordinary plugs without cords, thereby disconnecting the calling lamp from the disturbed subscriber's line.—A. Hacketal. Elberfeld, *Telegr. u. Fernsprech Tech.*

CURRENT IMPULSE SENDER FOR AUTOMATIC TELEPHONES.

Following is a description for a current impulse sender to be used in automatic or automanual telephones, provided with an electromagnetic locking device. When a subscriber uses an automatic telephone he has to wait with his selector until the selector fingers come in contact with an open wire. In order to inform the subscriber

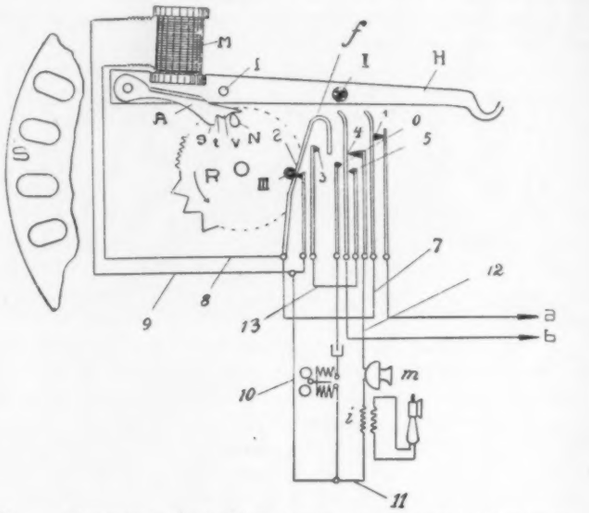


Fig. 3.—Electromagnetic Locking Device for Automatic Telephones.

of the fact that the connection between contact arm and selector has been made, an electromagnetic locking device is often used, which liberates the current impulse sender only when a selector arm has reached the line of the calling subscriber. Very sensitive devices must be used for this purpose, because the telephone currents are often very small, owing to high line resistances. Such instruments require very sensitively working construction details and a great coil cross section and are very expensive and take up much room.

Fig. 3 shows a design for a locking device, which during the functioning of an impulse sender is brought near an electromagnet, and is kept away from the latter, when current passes through the coil, *i. e.*, when the selector arm has connected with the subscriber line. The retention of the locking device releases the current impulse sender. If the electromagnetic coil is without current, the locking device prevents the impulse sender from supplying current. The coil is cut off automatically, as soon as a pin connected with the driving apparatus of the impulse sender is out of the vicinity of the locking apparatus. This arrangement has the advantage that the electromagnetic coil is under current only for a very short time and that the electromagnet is without current during the duration of conversation. Contacts are also connected to the impulse sender, which either disconnect or short-circuit the telephone circuit during sending of current impulses and thus avoid the disturbing clicking noises in the telephone receivers. The number disc in Fig. 3 is only shown in part for the sake of clearness. This disc *S* is coupled with a tooth gear wheel *R*, which during the return run of the disc *S* breaks the contact *i* and thereby produces the impulses. *M* designates an electromagnetic coil, whose armature *A* is formed into a pawl. If the receiver rests on its hook *H*, the pin *I* rests against the pawl *A* and presses the latter against the projection *N* fastened to the ratchet wheel *R*, whereby the ratchet *R* and also the disc *S* is locked. A pin *III* con-

nected with the ratchet *R* closes the contact *2* when the number disc *S* is at rest and short-circuits the coil *M*. The pin *III* is arranged so that in the turning of disc *S* the pin *i* is at first released so far as to release contact *2*. Only when the projection *N* has passed the projection *s*, can the pin *f* return so far as to close contact *3*. The pawl *A* allows a slight dead position and back play of the number disc *S* in order to bring the pawl *A* towards the electromagnetic coil *M* by having the nose *N* glide over the projection *v*. If the coil *M* is not under current, the pawl *A* falls back again, as soon as nose *N* reaches a grooved notch *t*. The impulse sender is now locked by a projection *s*, which prevents *N* from gliding out of the grove *t*. If the line *a, b*, is used by a call selector and connected with the battery, then with turning of disc *S*, by opening of contact *2*, the electromagnetic coil *M* receives current (*a, 1, 7, 8, M, 9, 10, 11, i, m, 12, 4, b*) and the pawl *A*, lifted mechanically by the nose *N*, remains attracted by the electromagnet, so that *N* passes by the projection *s* and the number of disc can be turned without hindrance. Contact *3* has meanwhile been closed, so that from now on until complete revolution of the number disc the telephone circuit and the coil *M* are short-circuited. The impulse sending circuit (*a, 1, 7, 3, 13, 5, b*), is therefore free from current weakening shunts. In the zero position of the disc *S* or of the ratchet *R* the contact *3* is opened again and the contact *2* again closed, whereby in case of conversation the coil *M* is short-circuited and the microphone *m* is connected to the line *a, b*. —*Telegr. u. Fernsprech.*

PROTECTION OF TELEPHONE LINES AGAINST HIGH TENSION CURRENTS.

C. E. Walsoe, a Danish engineer, has made extensive experiments with protective devices for telephone systems against high tension currents and calls attention to the importance of the vacuum protective devices. These vacuum voltage cut-outs have the purpose of making those tensions harmless that are too low to disrupt power fuses, as, for example, voltages of 3,000. But it is just as important to protect against 220 volts d. c. tension, for contact through telephones with such a current may cause injuries through shock and may also cause insulation disturbances in the instruments and the lines. The same dangers are present in 150 volts a. c., and any vacuum voltage cut-outs must protect against 200 volts d. c. and 150 volts a. c. The disruptive strength of a vacuum cut-out is given by the gas filling, the gas pressure, the separation, form and material of the electrodes. The electrode distance is usually low; the ionization tension of the gas between the electrodes is such that it requires at least a 300 volt difference to cause disruption. Starting from this point, the experimentor was able to construct cut-outs that were disrupted by voltages as low as 130. The cut-outs shown in Fig. 4 contain a dilute mixture of some rare gas and as electrodes some alkaline metal, which is brought into the vacuum tubes in a pure state by means of a special process. Usually the alkaline metal forms the cathode. The anode *a* is an aluminum pin, supported by an insulated protective tube *b*. The anode ends at a few millimeters distance from the cathode *c*, which consists of melted potassium, sodium or other alkaline metallic alloys. The platinum loops *d* and *e* are used to connect the current conductors. The vacuum tubes are filled with helium, neon, argon or mixtures of these gases under 1 to 2 mm. pressure. There is hardly any loss of gas through occlusion, so that the cut-outs last indefinitely. The vapors formed by the alkalines through discharges are the only impurities formed in the tubes. One might also use the electrode *a* as cathode and *c* as anode, if the surface of *c* is made so small, that in case if discharge, sufficient vapors are formed in order to cover *a* with a precipitate of alkaline metal.

These vacuum cut-outs can be used as shown in Fig. 4, *a* and *b*.

In case *a*, a fuse *C* has been connected between telephone wire *A* and the exchange trunk line *B*, which fuse melts at 0.5 ampere. Behind this a wire is branched off and connected to earth and into this line the vacuum cut-out *D* has been connected. If *A* is affected by voltages of more than 130, either due to contact with a live wire or though inductances, a light arc forms immediately in *D* and the fuse *C* melts, disconnecting the exchange trunk wire from the outdoor telephone line. In case *b*, a switch relay with parts *E, F, G*, has been connected between outdoor line *A* and exchange trunk line *B*. Coil *E* has a high resistance of 8,000 to 10,000. To protect the coil, a fuse might be placed near *C*. If dangerous voltages occur, a spark discharge forms in *D*, as a current powerful enough to evaporate the cathode cannot be formed due to the high resistance of *E*. The current flowing through *E* excites the relay, whose armature *F* is attracted, and breaks the contact with the exchange trunk line at *G*. The interruption lasts as long as the high tension is present, and disappears automatically when the current has disappeared.

The vacuum tubes can stand thousands of disruptive discharges without deterioration. Through slight changes, cut-outs were obtained whose disruptive strength lay below 110 volts. For example, using electrode *a* as cathode and covering its surface with a layer of potassium, with 5 mm. distance to electrode *c*, and a filling of 2/3 neon and 1/3 helium gas with 2 mm. pressure, the disruptive voltage was only 104. Of importance is the width of the vessel, *i. e.*, whether the ions at the cathode can pass over the entire road without disturbance, which is necessary for the normal cathode fall. This path is so great with rare gases, that in narrow tubes an abnormal cathode fall might take place, thereby

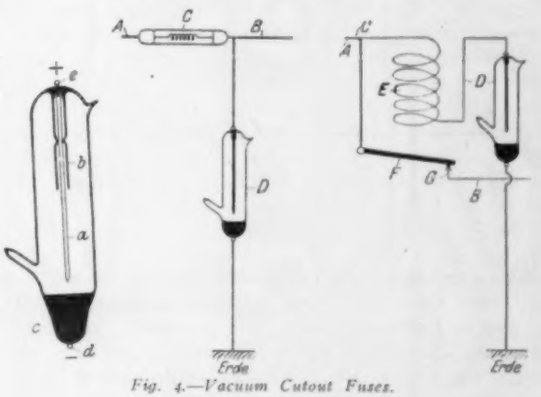


Fig. 4.—Vacuum Cutout Fuses.

increasing the discharge potential. With the normal use of the tube, the anode point *a* reaches into the cathode spark layer and increases the potential. However, this arrangement is the most advantageous.—C. E. Walsoe, *Elek. Zeit.*

SUPERVISION OF TELEPHONE OPERATORS.

Proper administration of telephone exchanges can help a great deal in bringing about higher efficiency in

the work of the operators, in making the time taken to make connections shorter. It is the duty of the supervisory officials to watch and supervise the operators and see to it that they do their work properly. Since the activity of the supervisors is known to the operators, part of the effect is lost, for the operators will naturally work better when they know that the supervisor is watching. On the other hand, in larger systems, where supervising is mechanical and not directly known to the operators there is this drawback, that the operators are called down for errors and faults in service, but are not rewarded or praised for good service. A proper control will therefore be one which not only takes care of the over different hours of the day. Aside from the obedience to the exchange rules, the speed with which connections are made should be recorded and this must be done with a stop watch.

The following points enumerated in the suggested index record cards cover most of the points that lead to complaints of operators' work. They can be either indicated by a check, or a cross, or other means. The duration of the observation, the average time for making connections, the number of connections per hour and the number of errors per 100 connections should be computed mathematically at the end of the observation period. The use of a slide rule will help immensely in fig-

Supervision of Operator.....*Name of Operator*.....*Supervisor* .....

Observed on date.....*from*.....*till*...*Hrs. and Min.* *Forenoon / Afternoon* *Hrs. of service*.....

Time of observation.....*Min.* *Average time for connections*.....*Sec.*

Computed No. of Connections per Hr.....*No. of errors in 100 connections*.....

OBSERVED IRREGULARITIES

	ON PART OF OPERATORS.																				BY OTHER EXCHANGES				OR PART OF SUBSCRIBERS					
							Repeat Nos																							
Current No.	Time for Connections.	Time Loss Not Fault of Operator.	Not Attentive.	Answers Not Clear and Not According to Regulations.	Does Not Understand Clearly Given Nos.	Incorrect.	Not.	Not When Subscriber Corrects Her.	Numbers Not Pronounced Properly.	Does Not Use Prescribed Expressions.	Converses With Subscriber.	Makes Improper Remarks.	Converses With Operators When Making Connections	Connects With Busy or Faulty Lines.			Other Errors.	Several Operators Connected at Same Time Over Trunks.			Answers Too Slow.	Does Not Speak Clearly.	Does Not Understand Operator.	Does Not Know Numbers When Calling.	Delays Operators in Other Ways.			Remarks.
Total																													

Controlling Official .....

Computations by .....

Filed for Statistics by.....

Transferred to Personal Records by .....

Chart for Supervision of Operators.

Fig. 5.

faults of the operators, but also records the good points and brings these to the attention of the administration.

For supervision, only older persons should be used and these should be trained in their work and follow a certain routine. Old operators who know telephone operation from A to Z are the only proper supervisors. In addition it should be possible to supervise several operators at the same time. Each operator should have a control or supervisor card on which the good and bad points of her service are recorded and which is kept in a card index for permanent reference. In order to give each operator a fair chance not fewer than 50 connections should be made the basis of a report in any of the points to be mentioned. These 50 or more connections must also be continuous and not odd operations spread uring the percentage of errors. These computations ought to be made by an official not used for observation of the operators. The results are entered on the permanent record cards that are filed alphabetically under the name of the operator. The points mentioned and observed might be recorded on cards or sheet similar to the model, Fig. 5.

The basis for a valuation of the operators' work will be the correctness and speed of making connections. But neither of the two alone should be used as a basis of valuation for these reasons: There are operators who are unable to reach a higher speed of working, no matter how hard they try, for they are not constituted physically and temperamentally to do rapid work. Nevertheless they try their best to follow directions and to work cor-

rectly. On the other hand there might be operators who work very quickly and who might take advantage of a valuation from the standpoint of speed alone to reach high records at the expense possibly of accuracy and correctness. To obtain a proper picture of the activity of the operators a large number of observation results for each operator, spread over a long interval of time, may be taken and the average percentages for correct connections and the time used for the same computed. We have then a ratio of: $\frac{\text{Percentage of correct connections}}{\text{Time for connections in sec.}} =$ n. This n will therefore be the figure which can be called efficiency factor. The greater the percentage of correct connections and the smaller the average time needed for these corrections, the greater is n. With a lower numerator and higher denominator the value of n will decrease. In other words the efficiency of the operators will be greater in proportion as n is greater and vice versa. Take an example: There are 5 observation results for an operator. The number of errors for 100 connections were: 5-15-10-5-10. Consequently the percentage of connections made without error is: 95-85-90-95-90 or an average of 91. The average time needed may be: 11-9.5-11-10-12 seconds. This gives an average of $t = 10.7$ sec. Consequently $n = \frac{91}{10.7} = 8.5$. The value of n will vary with the different telephone systems. The highest value which one can reach for any one system, which is perfect, is obtained by dividing 100, the maximum of correct connections, by the minimum time period for making a connection, or maximum $n = \frac{100}{\text{min.t}}$. For a closer valuation of the individual operators it will be necessary to find the average value of all of the operators. The average value of $N_d = X_n$, when m is the total number of operators employed.

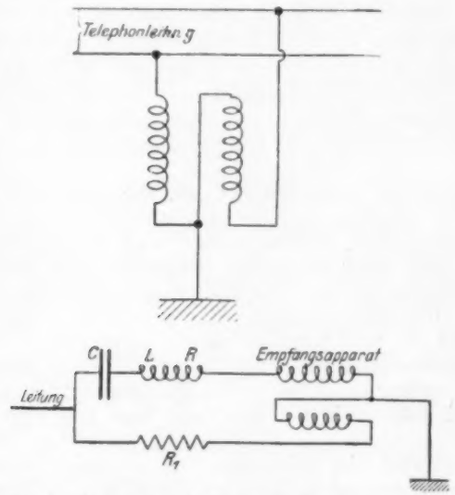


Fig. 6.—Telegraph and Telephone Protective Diagram.

To obtain a better picture of the efficiency it is of interest to use the graphic method. To this end the values for n are entered as abscissa on cross section paper, placing the values at regular intervals. The average value of n, say 8.5, is entered on the paper as a vertical heavy line. For ordinates the valuation periods of observations, here 1 to 5, are entered at regular intervals. Now if a straight line is drawn through the intersections of n_{max} and n_d a picture of the efficiency of each operator can be obtained in terms of speed and accuracy. Now if this chart were drawn on a large scale and the operators with the highest efficiencies notified of their results and perhaps rewarded in some way, this would serve as an incentive for them to keep up the good work and also a like incentive for the poorer ones to come up to these efficient operators.

It may also be of interest to find out whether the operators with the same efficiency change in the course of time. To this end efficiency curves may be employed, using the values of n as abscissa and using the percentages of these operators as ordinates. If the percentages of all operators for whom n is the same are entered on the cross section paper, the connection of the various points will give a curve which will steadily rise, gain a peak factor and then gradually fall. Through entry of new efficiency factors after other observation tests and by connecting the various curves, a progressive picture of the real efficiency of the operators can be obtained.—*Telegr. u. Fernsprech.*

INFLUENCE OF A. C. RAILWAY LINES ON TELEPHONE LINES.

A French engineer, M. Girousse, in *La Lumière Electrique* discusses the influence of high tension lines on telegraph and telephone lines. He gives a resumé of his investigations and offers several suggestions towards remedying the trouble. The telegraph and telephone lines that use only a single wire system are disturbed only during the use of the high tension railways line. He states that the disturbances cease as soon as the trains have passed, when the line is merely under tension. (This may not be the case at all times, for the induced currents which will be mentioned later also exert some influence on the telegraph and telephone lines.) Low tension lines that run parallel to the high tension line for any distance are influenced more than those that cross the high tension lines at right angles. As regards telegraph lines, the Hughes and Baudot instruments are influenced less than the Morse instruments. It was noticed on the Orlu-Toulon power transmission line that the telephone and telegraph instruments were disturbed even by this line. Telegraph operators working on a single line system are not exposed to electric shocks from the higher tension currents. In the two-wire telephone lines difficulty in communication occurs only with insulating resistances of about 30,000 Ω or less. But these conditions occur even when the high tension lines are simply under tension. Power transmission lines have the same effect. Persons who touch the insulated telephone poles would be shocked, unless adequately protected by protective measures.

The types of influence are divided by the author into those of influence on the equipment and those influencing the safety of the operators. For the instruments there are four types of influence: Electromagnetic induction, losses of voltage in the rails, contact with high tension wires, electrostatic phenomena. The electromagnetic induction is the most serious influence for the telephone lines. The e. m. f. which is induced in a telephone wire running parallel to the high tension line is proportional to the frequency of the high tension current, proportional to its strength and to the logarithm of the relation $\frac{d_1}{d_2}$

when d_1 and d_2 are the distances of the induced wire from the current carrying high tension wire and the return circuit of that line. As regards the practical influence on two-wire telephone lines, the inductive effects can be reduced if the two wires are transposed from time to time. If these are still influenced noticeably, these influences are due to higher harmonics of the fundamental sound waves and show in the form of musical, singing tones. The product of the intensity (amplitude) and the frequency of the upper harmonic oscillations may at times give an amount for the induced e. m. f., which cannot be neglected, since the frequency is great, even though the amplitude is small. The loss in tension in the return circuit rails and lines or the difference of the ground potential can cause currents in the low tension lines, which are grounded near the railway lines. The author cites a case of the Limoges a. c. line operating with 500 volts. Of course d. c. railway lines using high voltages offer the same difficulties.

Contact of low and high tension lines and crossing of wires must be guarded against by careful insulation and frequent inspections of danger points, especially in rainy seasons.

The electrostatic influences have much less influence on low tension lines than any other causes, at least from the side of the equipment. On the other hand they are important from the safety standpoint of the employes. The voltage induced in the low tension lines, which is proportional to that of the high tension line, decreases with growing distance between the two lines. At 100 feet distance its effect is negligible. If cables are used no effects are noted. The induced action is independent of the current load on the high tension lines. This tension can be reduced and even eliminated by more or less well grounded metal masses near the low tension lines (especially by other grounded telegraph lines), also through poor insulation of the low tension lines. Telegraph lines that are usually grounded in the offices by way of the coil of the receiving instruments are not influenced very much; they exert a protective influence on insulated telephone lines that are strung on the same poles with the telegraph wires.

Protective Measures.—The author divides these into protections of high tension and those of low tension systems. First of all one might think of a reduction of the current strength and voltage of the high tension line. Decreasing the current strength has a good influence, because it reduces the electromagnetic induction effects. Inversely an increase of the tension has a poor influence on the electrostatic phenomena. Usually the selection of current strength and voltage for high tension lines will take place without consideration of their effect on neighboring low tension lines. As regards the frequency of the high tension lines, the electromagnetic induction is lessened with lower frequency. Here telephone instruments are better off than telegraph instruments, and a decrease of frequency will effectually remedy trouble induced in telephone lines. A number of periods of 16½ would seem the best from the viewpoint of the low tension lines.

The position of the return circuit lines and rails is of great influence. Very important is the decrease of the amount of current flowing back through the earth near the high tension railway lines. If the rails could be insulated from the ground, which is not possible for reasons of safety to employes, the effects on the low tension lines would cease entirely. An important aid is the use of a special return circuit line, which is to take up a portion of the current flowing through the return circuit rails. The Dessau-Bitterfeld line has tried the use of suction transformers, which absorb most of the current of the return circuit flowing back through earth and rails. Another remedy is to increase the feed points, *i. e.*, the sub-power stations, which is perhaps an easy way out of the trouble.

Protections on the low tension lines are the most important points of safeguards. There are four possible means of protection: Removal of the low tension lines out of the vicinity of high tension lines; using cables for the telephone lines; doubling the line system, protective measures in the exchanges. The first remedy is a very expensive matter and probably not feasible in most cases, nor advisable as the cost of maintenance of lines away from the high tension railway or power lines is much higher. According to estimates such a system would cost somewhere near $800 per km. for telephone and telegraph lines. The use of underground cables for telephone and telegraph lines is also very useful, but expensive and can be used only on very important lines.

The doubling of lines is perhaps the best remedy. But as the installation of a large number of return circuits on the well crowded telegraph and telephone poles offers some difficulty it might be advisable to use a small number of common return circuits or else use these numerous return circuits only for the distance of worst danger.

As regards protective devices, the author mentions a so-called coupling transformer, which is a small auxiliary transformer, whose primary coil is connected to a catch wire hung from the telegraph pole, while the secondary coil, having somewhat more windings, is connected to the telegraph line to be protected. The e.m.f. induced in the pole wire and in the telegraph line to be protected have the same direction; the e.m.f appearing at the secondary terminals of the transformer acts against the e.m.f. induced in the telegraph wire and neutralizes it.

To protect the telegraph instruments, the author suggests the use of a differential coil having the same number of windings on both coils. (Fig. 6b.) The one coil is connected with a resistance R_1 using series connection, the other coil is connected to a capacity C and a self inductance LR. If both current circuits have the same resistance, and if C and LR are in resonance with the periods of the disturbing current, then the disturbing a.c. separates into two equal sections, equal in current strength and phase, which can have no effect on the instruments. The telegraph current does not flow through the condensor C but only the resistance R_1 and operates the receiving instrument.

In order to protect the telephone lines, the author suggests good insulation of the lines by keeping the insulators clean. Especially crossings of high and low tension lines must be well guarded and inspected. The telephone lines should also be transposed every 400 feet. The insulation at exchanges must also be watched. The use of transformers for the telephone currents is advised. To protect the linemen from shocks, the telephone lines should be equipped with the discharge coils shown in the Fig. 5*a*. This system is known as the Cailho system. The French electric railway lines and telephone departments have worked hand in hand to remove troublesome disturbances and to protect the workmen from dangers by high tension lines.—*La Lumière Electrique.*

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Weston's New Instruments

Problems hitherto considered impossible of solution have been solved in the designing of these electrodynamometer instruments. They are the latest development of instruments of this type and embody characteristics never before attained.

They are adapted to measurements of precision on a. c. or d. c. circuits, guaranteed to an accuracy of ¼ of 1 per cent full scale value either d. c. or a. c. circuits of any frequency to 133 cycles per second and any wave form. They can be used on circuits of any commercial frequency even as high as 500 cycles per second with very slight error due to phase displacement. Double ranges are provided for both current and voltage circuits. All current ranges can be used for 100 per cent overload indefinitely without introducing error.

Their movable systems have an extremely low moment of inertia and are very effectively damped. Indications are independent of room temperature, the heating effect of current passing through the windings, and the instruments are shielded from external magnetic influences.

The scales which are 5¼ inches long, are uniform throughout their entire length, a characteristic of great importance. Each scale is hand calibrated and is provided with a mirror over which the knife-edge pointer travels and the pointers are equipped with a simple zero setting device.

Special Model 310 wattmeters can be furnished for very low factors, such as core losses in transformers, giving full scale deflection for 20 per cent power factor, that is, the scale value in watts is 20 per cent of the volt-amperes applied. Temperature errors are very small and can be corrected by reference to the certificate that accompanies all Weston instruments. Scales are uniform and the instruments have otherwise the same general characteristics as the regular model.

For complete information regarding Model 310 wattmeters, and Model 329 polyphase wattmeters, write the company for bulletin No. 2002.

Model 310.

Model 329.

The portable polyphase electrodynamometers, Model 329, are instruments of precision, guaranteed to an accuracy of ½ of 1 per cent full scale value on a. c. circuits of any frequency to 133 cycles per second and any wave form.

Complete information regarding Model 329 wattmeters is given in bulletin No. 2002.

Weston a. c. and d. c. portable electrodynamometer voltmeters, Model 341, are instruments of precision adapted to use on a. c. or d. c. circuits, guaranteed to an accuracy of ¼ of 1 per cent full scale value.

Model 341.

Model 370.

The scales are 5¼ inches long. Owing to the principle of operation these instruments cannot be made with scales that are uniform throughout their entire length, but the upper 4/5 portion of the scale is remarkably legible and uniform.

For complete information regarding Model 341 voltmeters write for Bulletin No. 2004.

Weston a. c. and d. c. portable electrodynamometer ammeter, Model 370, is guaranteed to an accuracy of ¼ of 1 per cent full scale value.

For complete information regarding Model 370 write for Bulletin No. 2003.

Holtzer-Cabot in New Factory

The new factory of the Holtzer-Cabot Electric Company on Amory street in the Roxbury district of Boston, Mass., for which the ground was first broken on May 21, 1914, has just been occupied by the company. The executive offices and factory, formerly at Brookline, have been moved to the new location, together with the Boston factories of the company, which were located on Albany street and on Bristol street, thus bringing under one roof all the departments of the industry.

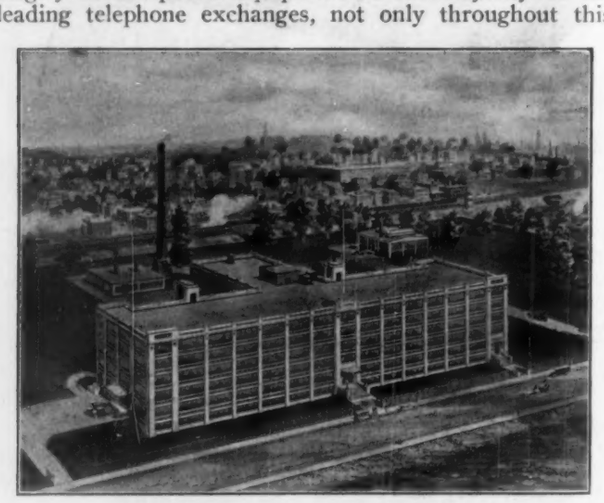
The new factory consists of a main building 300 feet long by 60 feet wide, six stories high, with an annex 100 feet long by 60 feet wide, 6 stories high, and with a subbasement 60 feet by 60 feet, which is used as a garage. The boiler house is 42 feet by 42 feet, 20 feet high, with a 5-foot 6-inch chimney 120 feet high; the foundry building is 60 feet by 60 feet, one story high.

These buildings are grouped on a lot of land of approximately 250,000 square feet, located on Amory street, Roxbury, and backing up on the shore line of the New York, New Haven & Hartford Railway. The construction is reinforced concrete with brick paneled walls on the outside and terra cotta partitions plastered on the inside, and is fireproof in the true and strict sense of the word. Woodwork has been entirely eliminated, with the

exception of the few office partitions and finish on the second floor in the general office.

The business of the Holtzer-Cabot Electric Company, established in 1875 by Mr. Charles W. Holtzer, and incorporated in 1889, has not been one of mushroom growth, but on the contrary one of steady, healthy and continuous development, from the early days before the telephone was invented, when the demand for electrical apparatus was very limited. During these early days the manufacturing was confined chiefly to house and hotel annunciators, bells, batteries, etc.

The advent of the telephone opened up a new field, the possibilities of which the company was not slow to recognize. It was, in fact, one of the pioneers to enter the field, developing a lot of apparatus and securing a large share of the business of the independent telephone companies throughout the country. This telephone business was further augmented after the company commenced the manufacture of power apparatus for telephone work, until today its motor generators figure largely in the power equipment of the majority of the leading telephone exchanges, not only throughout this



New Factory of Holtzer-Cabot Company.

country but in many of the up-to-date foreign exchanges as well.

Another line, the possibilities of which the company early foresaw, was the manufacture of electric motors, and it entered aggressively into this larger field for development some eighteen years ago. It was one of the first to engage in the manufacture of alternating current motors, and is now turning out a large number of alternating and direct current motors annually for use with coffee grinders, meat choppers, cream separators, washing machines, vacuum cleaners, adding machines, automatic musical instruments, and a large variety of kindred devices. The company's motor business is, however, by no means, confined to these lines; it manufactures dynamos for lighting and electroplating, and motors for grinding and polishing, and for driving printing presses and machinery of various kinds.

Within recent years the company has designed and developed a great deal of special apparatus for wireless work and for the United States government, that is, for the army, navy and treasury departments. The majority of the battleships of the navy are equipped with the Holtzer-Cabot system of gunfire control and intercommunication.

The company's products in other lines comprise interior telephones, watchman's detectors, annunciators, electric bells, wire connectors and cable terminals, hospital signaling systems, school and factory fire alarm systems, gas engine igniters, tachometers, lighting dynamos, carbureters, and electric horns for automobiles.

The company owns a large number of valuable patents covering its various lines of apparatus.

The company has succeeded in establishing a reputation for its apparatus approached by few and excelled by none of its competitors. The name "Holtzer-Cabot" has become synonymous with "the best manufactured."

The increase of business and development in the motor line necessitated, several years ago, the leasing of a large factory building in Boston, which was soon taxed to its utmost capacity, and additional premises had to be secured. The new factory admits of consolidating the several plants, and by combining these will effect a large saving and result in increased efficiency in every way.

American Association of Engineers' Convention

Plans for the national convention of the American Association of Engineers to be held in Chicago, December 10-11, are being rapidly completed. All engineering societies have been invited to send official representatives to the convention to join in the discussion and assist in attempts to solve a few of the welfare problems confronting the engineer.

During the latter half of September, a gain of 55 members was made. A national membership committee has been selected to push the organization of local chapters in various parts of the United States. Those appointed on the committee are A. H. Krom, assistant engineer Illinois State Public Utilities Commission; F. H. Newell, professor of civil engineering, University of Illinois; S. Steenerson, engineer Minnesota Highway Commission, Crookston, Minn.; Edwin R. Webster, civil engineer, Marion, Iowa; Daniel B. Luten, bridge engineer, Indianapolis; O. L. Dent, referee in drainage matters, Bemidji, Minn.; R. A. West, civil engineer, Tye River, Va.; Israel L. Beerman, engineer New York State Highway Commission, Filmore, N. Y.; Harold Almert, consulting engineer, Chicago; W. N. Winter, electrical engineer, Hood River, Ore.; H. L. Holderman, civil engineer, C. M. & St. P. Ry., Lewistown, Mont.; Ernest McCullough, consulting engineer, Chicago; George C. Keech, electrical engineer, Chicago; A. T. North, contracting engineer, Chicago.

Owing to the increase in its activities the Association has taken larger quarters at 29 South La Salle street, Chicago.

Supervision of the work of the qualification committee has been undertaken by Ernest McCullough, Chicago. The Service Clearing House is actively engaged in putting the engineer in touch with the employer and the employer in touch with the man without charge. One of the largest electrical manufacturing companies in the United States has given the association the preference in filling all vacancies which require men of technical training.

An inspection was made of the tunnels of the Chicago Warehouse & Terminal Company on October 9, by members of the association. This was the first of a series of weekly inspection tours.

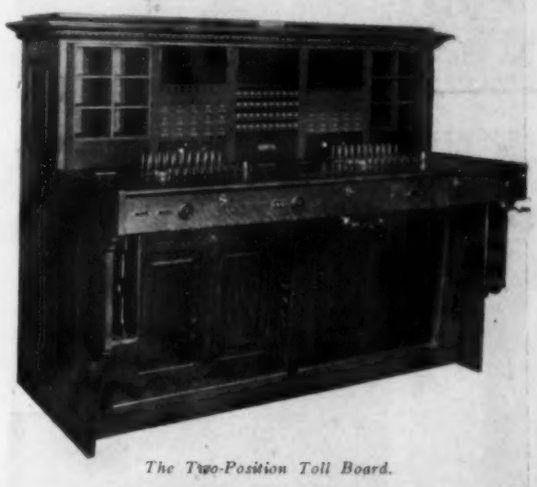
The Calculagraph Company, Henry Abbott president, has just completed a commodious two-story plant of reinforced concrete, steel and wire-glass, at Harrison, N. J. The new plant will be devoted exclusively to the manufacture of the company's product.

Winchester's Solution of the Traffic Problem

Traffic is a subject ordinarily dismissed by the manager of a small system as a complex study which is without advantage except in the larger cities. It is often regarded as a mysterious, intangible something to be understood only by the initiated. Such an impression is most unfortunate. Traffic is a fascinating study and is worthy of receiving attention, even in the smallest offices. Its value in dollars and cents is not always to be seen at once, but anyone who regularly and thoroughly analyzes his system's traffic will never regret the time spent. A traffic study shows up the class of services that is being rendered, and direct comparisons may be made between various exchanges. The average time required by operators to answer calls or the percentage of trouble complaints, for instance, indicates whether the patrons are given the grade of service they have a right to expect. Such faults as improper use of various circuits, improper supervision, operating phrases or lack of courtesy may be eliminated and every possible step taken to make the service rendered an active advertisement for the system. The capabilities of each operator are observed, and the load so distributed as to require a minimum number of operators for each hour of the day consistent with the grade of service. Finally the exact operating cost for each station per year is determined. While making these periodic analyses a manager comes to realize the capabilities and limitations of everything connected with a telephone plant, human or otherwise. His horizon is enlarged, and he is the man who will be called to a larger field.

Traffic studies are of particular value in determining the requirements of a new central office equipment. A man who thoroughly understands the traffic in his own and neighboring offices is in a position to sift the claims and traffic studies of manufacturers down to their true relative value. He is able to detect misleading comparisons between manifestly inefficient plants and the apparently wonderful records of their successors. Finally he is in a position to choose intelligently what system best meets his local requirements and realizes when the most satisfactory layout has been secured.

The Eastern Indiana Telephone Company, a progressive concern operating near the eastern boundry of Indiana, is enthusiastic on the subject of traffic efficiency, and made a long, careful study before placing an order for its new office in Winchester, Ind. The board which is now being installed in the Winchester exchange is accordingly expected to nicely meet the peculiar local conditions. The system is of the bridging multiple, lamp line type, with provision for mounting a line lamp above each multiple jack. No answering jacks are provided, all calls being answered directly in the multiple. Although wiring is furnished for a lamp above each multiple jack lamp sockets are installed only where desired. Two lamps are ordinarily expected to be used in connection with each line, one mounted behind a white opalescent lamp cap and the other behind a green cap. Operators are expected to give attention primarily to the banks of white lights within their reach, and when not so occupied to answer the green lights. The equivalent of an ancilliary multiple is in this manner secured. It is, however, more flexible than an ancilliary multiple, as a distribution of the load is secured by shifting either lamp associated with a given line from one lamp socket to another in a distant position. The usual intermediate frame jumpers, are, therefore, not required and this frame is eliminated.

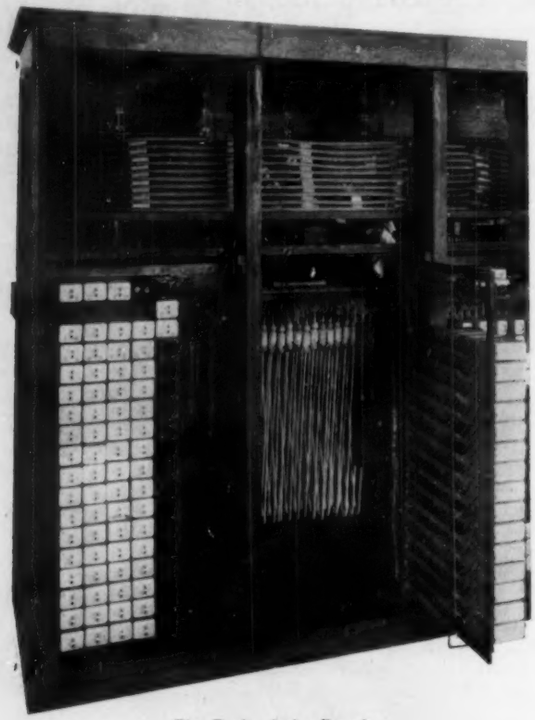


The Two-Position Toll Board.

The Winchester Switchboard, Stromberg-Carlson Type.

The cord circuits are somewhat different from any previously installed. They are equipped with the usual four-party automatic ringing, automatic operator's cut in and cut off, automatic peg count and automatic ringing trip which cuts off the ringing current instantly upon rais-

ing the receiver from the hook. In addition there is a recall feature by which an operator first handling a con-



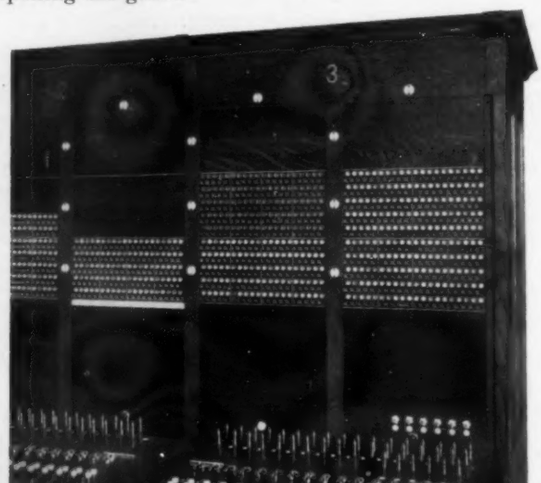
The Back of the Board.

nection for a called party is notified of the recall by a periodic flashing of the supervisory lamp.

The Winchester installation comprises at present three unit type sections of dull quartered oak, six hun-

The Chief Operator's Desk.

dred and forty regular subscribers' lines and forty magneto lines. In the first position are also a set of toll and miscellaneous trunk circuits. All of the relays and condensers, as will be seen from the rear view, are mounted upon hinged gates. A convenient arrangement is effected by grouping the relays and condensers for each cord circuit together on individual mounting strips. Fear has at times been expressed that wires in the local cable to a hinged relay gate might in time become broken due to the continual torsion. The local cable hinge made possible by gate construction illustrated is the same type as commonly used upon keyboards, but with a much longer sweep over which the torsion is distributed, and being firmly anchored at both ends, hinge trouble is claimed to be an unknown factor. When the gate is swung open all relays are accessible on both sides and entirely outside of the cabinet, where most easily inspected. Free access to the cord compartments and terminal boards is obtained by opening the gates.



A Close-Up View of One Position.

A view is also presented of the new Winchester chief operator's desk. Besides the usual trunks, monitor and observation circuits, the peg count registers for each switchboard position are mounted in this desk. A portion of the desk's surface is so arranged as to slide back under the turret, exposing the card index tabs.

In addition to the local board there is also a two position toll board. This cabinet is finished to match the other equipment and at present accommodates twenty-five toll lines.

New terminal room equipment is being installed, including main distributing frame, relay rack, power fuse panel and mercury arc rectifier. The entire central office equipment was furnished and is being installed by the Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York.

Better have your ideas stolen than locked up in your desk with no one the wiser. To say: "A man I trusted with that idea stole it from me," makes you a wronged genius; to say: "I had that planned out, but never did anything with it," brands you as incompetent, or at least slow.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES

Joseph Tausek, who has managed the Riverside exchange for the Pacific Telephone & Telegraph Company at California for the past four and a half years, has resigned to accept an important position with the American Telephone and Telegraph Company in New York. F. D. Allen of Los Angeles succeeds Mr. Tausek.

T. D. Lockwood, a member of the executive committee of the Telephone Pioneers of America, accepted the commemorative medal at the Exposition's ceremony honoring that organization in the Palace of Liberal Arts, on September 23.

G. H. Virtue has been made manager of the Audubon exchange for the Iowa Telephone Company, coming from the office at Council Bluffs.

George W. Abel, manager of the Tri-State Telephone Company at Morris, Minnesota, is confined to his home with injuries which he received by coming in contact with a live wire.

Mack Mofford of Brazil has been named manager for the Dana, Newport and Clinton telephone lines in Indiana.

Harry Raber will shortly leave for Tucson, Arizona, where he will assume the duties of district wire chief for the Mountain States Telephone & Telegraph Company with which concern he has been employed in Bisbee during the past four years.

Guy Gauweiler, a lineman for the Michigan State Telephone Company at Saginaw, was electrocuated while at work on a pole October 4.

O. B. Beam of York has been appointed manager at Reading, Pennsylvania, for the Bell Telephone Company to succeed Norman B. Wamsher, who recently resigned.

General Manager David Laird of the Southern Bell Telephone and Telegraph Company of Georgia has announced the following important changes and promotions in his division effective November 1. C. G. Beck, district manager at Savannah, has been promoted to commercial superintendent with headquarters at Savannah; W. S. Henley, manager at Waycross will succeed Mr. Beck; M. E. Birson, manager at Brunswick, will succeed Mr. Henley; T. L. Jordan, chief canvasser at Jacksonville, has been appointed manager at Brunswick and I. E. Brown, of the publicity office, Atlanta, has been appointed chief canvasser at Jacksonville.

C. V. Bridwell of Louisville has been made manager of the Cumberland telephone office at Henderson, Kentucky, succeeding Fred J. Gorham, resigned.

NEWS FROM THE FIELD

ARKANSAS.

The Southwestern Telephone Company has begun work remodeling the telephone system at Walnut Ridge. The company will expend $10,000 in improvements.

Local managers of the Southwestern Telephone & Telegraph Company in the Little Rock district met at the Capital hotel a short time ago. Business conditions were discussed, reports of the last fiscal year's business were given and plans for the next year were made. A conference was also held at the Goldman hotel, Fort Smith.

The Southwestern Telephone Company is completely rebuilding its lines at Benton by putting in new poles, cables, boxes and switchboards. The cost will be about $10,000.

CANADA.

Damage of $5,000 was recently done to switchboard and building of St. John's telephone exchange, corner of Borrows avenue and Aikens street, Winnipeg, Manitoba, by a fire which started on the roof of the building.

COLORADO.

The final telephone link connecting Mack with Cisco has been completed.

FLORIDA.

The Peninsula Telephone Company is installing the semi-automatic system in Lakeland.

IDAHO

A new telephone line has been started by Deputy Forest Supervisor Herbert G. McPheters, which will connect Rooks Creek with the Liberal ranger station on Little Smoky.

The Mountain States Telephone and Telegraph Company will have all of its main and branch, short and long distance lines radiating from Hailey and Bellevue repaired and put into good working condition for the winter.

ILLINOIS.

Under an arrangement made more than a year ago the Keystone Telephone Company of Philadelphia has sold to Harper & Turner $300,000 first mortgage 5s. It was stated that all the bonds have been placed.

Danvers Telephone Company, Danvers; capital, $5,000; incorporators, Gilbert Wiley, Rosa May Wiley, Charles T. McKinney.

Telephone dispatching will shortly be adopted on the Ohio division of the Baltimore and Ohio Southwestern Railroad, on the main line between Cincinnati and Parkersburg.

Perry Telephone Company, Perry; capital, $2,500; incorporators, John Johnson, James H. Hill, George Wagner.

The stockholders of the Farmington Telephone Company held an adjourned meeting in the city building at Farmington. They adopted a constitution and by-laws and elected the following officers: F. S. Vandersloot, F. E. Crane, S. P. Wood, Emerson Clark, Dr. Will Plumer, Linn Dikeman, Dr. J. Connelly, E. J. Parks and A. A. Vandervoort, directors; and president, F. S. Vandersloot; vice-president, Dr. Connelly; secretary, Dr. Fash; treasurer, E. L. Parks.

The Bell telephone system in the United States shows gross earnings for the eight months ended August 31 of $156,750,451, as against $49,667,227, the previous year. Net earnings for the same period was $4,000,000 better than in 1914.

INDIANA.

The stockholders of the Reddington Telephone Company held their annual meeting at the Fox schoolhouse, near Reddington, and following the regular reports officers for the coming year were chosen as follows: Henry Hohenstreiter, manager, and A. F. Biddle, treasurer. Ed. Talley, William Swengle and Valentine Hunt were elected directors.

The new telephone switchboard for the fire department headquarters at Fort Wayne has arrived from New York and will shortly be installed.

The West Baden Springs Company has just completed the installation of a new telephone system in its West Baden hotel, the work having been done and the service is to be furnished by the Central Union Telephone Company.

The Farmers Mutual Telephone Company of Columbia City held the regular meeting of its stockholders October 7 at the Tuttle opera house. The reports of the treasurer, secretary and auditing committee were read and approved. The old officers were re-elected as follows: Albert Bush, president; E. E. Rindfusz, vice-president; W. H. Carter, treasurer, and Clinton Wilcox, secretary. R. R. Scott was re-elected manager of the company.

The Whitley County Telephone Company held their annual meeting at their offices in Columbia City October 14, and elected the following as their board of directors: James D. Adams, F. F. Morsches, John C. Meyers, Mrs. Mary Magley, A. H. Kreig, W. F. McLallen, S. J. Peabody and Joseph Raupfer. The appointed directors named the following officers: James D. Adams, president; F. F. Morsches, vice-president; Mrs. Mary Magley, secretary and treasurer. The directors voted that John C. Pentz should be retained as the general manager.

IOWA.

Lon Dunn of Milo has disposed of the Moravia telephone exchange to G. W. Leyda of Oxford Junction.

Extensions and improvements that will amount to $25,000 are to be made by the Iowa Telephone Company in Ames, work to begin at once. The capacity of the office plant is to be increased by 1,800 more wires, and the outside work will include the laying of underground conduit systems along Clark avenue, going north as far as Tenth street, with cross street branches leading a half block each way, from which points the overhead system will be distributed. The toll lines will also be carried out of the city by underground conduits.

The Farmers & Merchants Telephone Company on October 1 put into effect the following rates for city telephone service of the Hawarden exchange. Business telephones will be charged at the rate of $2 per month, payable at the office of the company on or before the 10th day of the month for which service is rendered, subject to a collection charge of twenty-five cents thereafter. Residence telephones, straight line and party line, will be charged the same rate as in the past, $1.25 and $1.00 respectively, subject to an increase of twenty-five cents additional if not paid on or before the 10th at the company's office.

The annual meeting of the stockholders of the Mutual Telephone Company of Greenfield was held October 4. The following directors were elected: J. E. Wallace, Chas. Hoepner, J. H. Jones, for one year; Andrew Lawson, G. H. Rodgers, E. W. Vandewater, for two years; S. Kreps, L. S. Roberts and D. C. Pote, for three-year term. E. E. Perry was re-elected secretary and treasurer. S. Kreps is still president of the company and Andrew Lawson was elected vice-president.

KANSAS.

Work on the installation of the new central plant for the Kansas Telephone Company, consolidation of the old Home and Bell plants at Ottawa is being pushed to completion. W. P. Hemphill, owner and manager, a Kansas City man will have a big force of men at work replacing all of the old fashioned residence and office telephones with the latest instruments. Blocks of cable in the business districts are supplanting poles and wires. The new plant will cost complete $75,000.

The Bell Telephone Company is spending $25,000 on a new telephone system in Kingman. The plant is being installed under the direction of H. L. Enoch, district plant chief, with headquarters at Hutchinson.

The Haverhill Co-operative Telephone Association has been authorized by the public utilities commission to issue $4,320 worth of common stock. Sixty of the 114 shares to be issued are to go to the stockholders of the Rosehill-Augusta Mutual Telephone, recently consolidated with the Haverhill. The other fifty four shares are to be sold at par, $30 a share. The Haverhill Association is capitalized at $21,000.

Finishing touches on the reformatory telephone exchange at Hutchinson, which is being installed by the Missouri & Kansas Telephone Company, is being delayed by a lack of wire.

The United Telephone Company will erect a new building at Lorraine which will be used exclusively for their exchange at that place.

New equipment costing almost $10,000 more than that first planned for the Kingman telephone exchange was added to the expense of installing the common battery service at Kingman. The telephone company will spend nearly $35,000 on the local system instead of $25,000, as first reported.

KENTUCKY.

Hazel Green, Grassy Lacy Creek and Compton Telephone Company, Hazel Green; capital, $500. Incorporators: Clay Cecil, William Reed and A. S. Cecil.

LOUISIANA.

Manager Clark of the Cumberland Telephone Company has just completed a new phone line running west into St. Helena parish, connecting Liverpool and Tinus with the Kentwood exchange, a distance of twenty miles.

MICHIGAN.

The general office of the United Home Telephone Company of Muskegon will shortly move to their new home just erected.

At a meeting of the stockholders of the Valley Home Telephone Company at the general offices in Saginaw, it was voted to amend the articles of association by increasing the dividends on preferred stock from 6 to 7 per cent. This amendment was adopted by a vote of 590 shares out of a total of 761. This action was taken to assist in selling the stock of the concern. The money which is expected to be received from the sale of stock will be expended for extensions and improvements. It is said 2,500 telephones will be added to the Bay City station, making a total of 5,500 there.

The board of the Citizens Telephone Company, at its meeting held recently declared the seventy-third regular quarterly dividend, amounting to $57,776.26, payable October 20 to stockholders of record September 30.

The Michigan State Telephone Company has purchased the property at 767-69 and 775 Congress street east, Detroit, as the site for a new building for the East exchange to be erected in the near future at a cost of $60,000. The building will be of steel and concrete fireproof construction, 43 by 105 feet in size and four stories high.

Linemen for both the Michigan State Telephone Company and the Citizens Telephone Company in Jackson are busy preparing the companies' lines for the wear and onslaughts of winter.

The new $25,000 exchange of the United Home Telephone Company in Muskegon, has just been completed and the installation of the automatic instruments is well under way. The system it is expected will be in operation by December 1.

MINNESOTA.

Switchboards and all cables have arrived for the completion of the Brainerd telephone plant by the Minnesota State Telephone Company.

F. E. Lister, district commercial manager of the Mesaba, Duluth and Northwestern Telephone Companies, of Duluth, has announced that the Bemidji office of the Northwestern Telephone Company, formerly under the Grand Forks supervision, has been changed to the Duluth division, the change taking place October 1.

The telephone line which will connect the Little Fork Valley with Virginia and the range will be completed in about two months, according to L. F. Luthey of Cook. The poles for the transmission line between Virginia and Cook are in place and the stringing of the wires will be started in a short time.

The Northwestern Telephone Company is improving its plant at Cass Lake. Aerial cables are taking the place of open wires and modern improvements are being made in all departments. The new office will be located in the First National Bank building in a very short time.

The Farmers Telephone Company of Olmsted county has been incorporated for $2,000 to be divided into two hundred shares of $10 each. The principal place for the transaction of business is to be the town of Haverhill. Elmer E. Dodge, Orin Pike and Shirley B. Shonyo.

MISSOURI.

Bert Treon, manager of the Bell Telephone Company at Trenton, states that his company expects to have a direct line from Princeton to Trenton ready for service in a very short time. The Bell company do not intend to build a new copper line but to make a phantom system.

The following are directors and officers elected for the ensuing year at the Farmers and Merchants Telephone Company, of Monroe City, meeting: Directors—L. O. Wilson, Dr. J. H. Bell, James Smith, Roy McFarland, I. L. Owen, W. J. Rouse, W. H. Elliott, J. W. Hamilton, J. W. Rouse, John Cleary, Charles Elzea. Officers—Roy McFarland, president; James Smith, first vice-president; L. O. Wilson, secretary and manager; W. R. P. Jackson, treasurer.

NEBRASKA.

Free telephone service between Hastings and Glenvil has been re-established following the sale of the Glenvil exchange to the Clay county rural telephone interests. The sale enables the two systems to exchange business, whereas the service was impossible under the ruling of the state railway commission when both systems were owned by the same company.

The Tri-State Phone Company, Chadron, has been incorporated with a capital stock of $250,000, and E. D. Warner, of Chadron, is the general manager.

Statement of the ownership, management, etc., of TELEPHONE ENGINEER, published monthly, at Chicago, Ill., required by the Act of August 24, 1912.

NOTE—This statement is to be made in duplicate, both copies to be delivered by the publisher to the postmaster, who will send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office.

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There are no bonds, mortgages or other securities outstanding against TELEPHONE ENGINEER.

ED J. MOCK, *Business Manager.*

Sworn to and subscribed before me this thirtieth day of September, 1915.

(Seal) LEONA J. EKSTROM.

My commission expires Aug. 17, 1918.